COST CONSTRAINED IMPROVEMENTS TO THE MILITARY RETIREMENT SYSTEM

THESIS
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THESIS

Presented to the Faculty of the School of Operational Sciences
of the Air Force Institute of Technology
Air University
In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Operations Research

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March, 1993

THESIS APPROVAL

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THESIS TITLE: Cost Constrained Improvements to the Military Retirement System

DEFENSE DATE: March 4, 1993

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Acknowledgements

First, I would like to thank my husband, Mark. His understanding, putting off his own homework and countless hours as a "single" parent mean more to me than words could ever express. Second, I would like to thank Donovan, my AFIT baby. When the stress seemed unbearable, you made me remember what was really important in life, my family. Third, I would like to thank Roger Scheidt and Anastasia Anderson for their time and invaluable help with the health care costs. They had no obligation to help, yet they went out of their way to get me this very important data. Fourth, I wish to express my heart felt thanks to Colonel Schuppe for being my thesis advisor. Colonel Schuppe always knew how and when to help. In addition, he understood what a thesis was all about! Finally, I shall never forget my AFIT experience, especially the deep and lasting friendships I made. Thanks guys!

Cynthia Ann Brown

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Abstract

This research studies possible changes to the current military retirement system. The current military retirement system refers to the system provided under the Military Reform Act of 1986. A new system is proposed which would provide the retiree with four options. Option 1 would provide a pay annuity and medical benefits to the retiree (this is the current system). Option 2 would provide a pay lump sum in place of the annuity and would offer medical benefits. Option 3 would offer the pay annuity but give a medical lump sum amount in place of the medical benefit. Finally, option 4 would provide both a pay and a medical lump sum amount. The research investigates the total cost to the government to decide whether the proposed system would be more economical than the current system. In addition, the lump sum amounts a retiree would receive are calculated for different benefit levels.

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I. Introduction

1.1 Background

Today's world is a very different place from forty, twenty or even ten years ago. The cold war is over. The backbone of the military threat is gone and with it the American public's support for a stronger, better equipped military. This lack of support has a major consequence - a shrinking military budget. All weapon systems, support functions, training programs, benefit packages and personnel requirements are being carefully scrutinized. The military retirement system (MRS) is one major benefit package that has a long history of scrutiny.

The MRS has three main components: a pay annuity, a health care benefit, and commissary/base exchange(BX) privileges. Both the pay annuity and health care costs are funded by the DoD budget. The commissary/BX component are basically self-supporting and therefore, are left out of the criticism of the MRS. However, the pay annuity and health care benefit are highly visible cost items in the DoD budget.

Opponents of the MRS say it is too expensive and that the benefits are excessive. They suggest changing the pay annuity to more closely match the 401K plans prevalent in the civilian community. These plans generally allow retirement payments to start after the age of 65. In addition, these opponents feel military retirees should pay more of their health care costs.

On the other hand, proponents support the current military retirement system because of the need to keep a high quality force. Military members make numerous sacrifices to have a 20+ year career. These sacrifices include such things as long

and/or frequent family separations, long work hours, low pay compared to comparable civilian jobs, many moves, and possible involuntary reductions in force. In addition, the greatest sacrifice could be the member's life. In no other job do employees agree to risk the possibility of death for their country's policies. Two recent examples of this sacrifice are the deaths in Desert Storm and the Somalia aid effort. Therefore, members are entitled to adequate compensation. And the nation, in return, receives a superior fighting force to face any national or international threat.

The retention of these quality members is a must to guarantee the fighting capability of the force. These members say the current level of retirement benefits is a vital part of their decision to make the military a career. *Air Force Magazine* conducted a study of Air Force personnel to determine their attitudes on military careers. The major conclusion of the study was:

> The single most important institutional benefit and career incentive the Air Force offers is the military retirement system. That is borne out consistently by every available measure of people's attitudes and perceptions. In a survey conducted in 1984, fifty-five percent of the respondents indicated that a significant change to the retirement system would be the one thing most likely to cause them to leave. That was a higher percentage than for all other potential resignation reasons combined. It's the most urgent topic of concern among Air Force people and their families. They view the threat of further change as a breach of faith, as a lessening of institutional support, and as an indication that their sacrifice and contributions are not appropriately recognized by policymakers. (21:108)

The fact that people leave if retirement benefits are decreased may not seem like a major concern in today's environment of the shrinking defense budget. The smaller the DoD budget, the smaller the force size. Reductions in the overall military force are being made using Voluntary Separation Incentives (VSI/SSB), Selective Early Retirement Boards (SERB), and involuntary Reduction In Force (RIF) boards. If the *Air Force Magazine* survey is still accurate, a reduction in retirement benefits would hasten this process. However, the DoD would have little control over which personnel decided to separate and which decided to stay. In fact, the Congressional

Budget Office published a report in 1984 that explained the impact of changing the MRS. The report states: "It is important to remember . . . changes in the military retirement system typically will affect retention and thus alter the size and average experience level of the armed services, with consequent effects on the overall cost of military manpower"(4:50). If the separating members are the most skilled and educated, a mediocre fighting force could result. Is this the force the American public wants to fight our next conflict?

1.2 Problem

In recent years, the defense budget has been shrinking. DoD officials, along with Congress, have had to decide what to retain and what to eliminate. These cost cutting actions have affected everyone. The military retirement system has a long history of growth and most recently, cuts. In August 1986, retirement benefits were reduced by lowering the amount of pay a retiree would receive each year. Today's political leaders continue to look for more cuts to military retirement benefits. In a speech to Congress, Bob Hale, assistant director of the National Security Division of the congressional Budget Office (CBO), stated that one possible cost saving measure would be a reduction in the health care benefit provided to retirees. This benefit has never been reduced in the past. Chapter 2 examines these reductions and provides an in-depth look at the current system. If this reduction were to go into effect, the military force structure might drastically change. Is there another way to cut costs without cutting benefits? All the current cost saving methods have decreased benefits while keeping the same basic benefit structure. This benefit structure has always been a pay annuity starting at retirement and medical benefits for the retiree and his/her family at military facilities on a space available basis. In addition, retirees and families are allowed to participate in the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS). This is a health insurance plan supported by the government to defray retiree medical costs. Chapter 2 details eligibility, operation

and costs of the CHAMPUS system to both the government and the retiree. This benefit structure has not been changed in the past. A possibility to reduce MRS costs is to change the system's structure. Consequently, this thesis will evaluate three options to the current MRS benefit structure.

1.3 Scope

This thesis investigates the cost of several Military Retirement System options. These options are based on benefit structure changes *not* explicitly on reducing costs. This research will be limited to exploring cost–for–benefit tradeoffs. These tradeoff options are listed below.

1. A lump sum payment instead of an annuity for retirement pay.
2. A lump sum payment replacing health care benefits.
3. A lump sum payment replacing both the pay annuity and the health care benefit.

These options will be tested at different selection rates and then measured against the current cost of the military retirement system.

1.4 Approach

This research will evaluate the cost differences between the current system and three options. The three options will incorporate benefits into the military retirement system that are not currently charged to the Military Retirement Fund. This fund is where all the accrued money is "stored" until it is needed. At the present time, only pay annuities are funded through the military retirement fund. This research will add health care costs to the retirement structure. These costs can then be calculated and added to the current system for comparison to the three options. All costs will be presented and compared using present worth calculations (1992 dollars).

1.5 Limitations

This research has certain limitations and assumptions. The main limitations and assumptions are listed below. Chapter 3 also describes assumptions that are explained as they are encountered in the implementation of the model.

1. Selection rates will primarily be used for sensitivity analysis. However, data will not be collected to quantify these rates with today's military members.
2. This study will not quantify systems proposed by other individuals for comparisons. The only comparisons made will be between the current system and the three options proposed in section 1.3.
3. This thesis will investigate cost to the MRS of people entering after implementation of the August 1986 change to military benefits. In other words, this study calculates the delta (the difference in cost) between people retiring using the post August 1986 system versus the proposed system. Anyone in the system prior to this study is considered a sunk cost and "untouchable" by a new system.
4. Only active-duty non-disability personnel are included in the study.
5. A study period of 20 years was used for all the calculations. This may be too short since life expectancy is increasing. However, due to time and complexity constraints, this time period was adopted. It is important to note that relative costs are important not absolute costs. A longer study period will change the absolute costs and may or may not change the relative costs. That is why the time period of the study is important. It could affect the decision made as to the "best" system.
6. During the 20 year study period, the current military retirement system and benefit structure remain constant.

1.6 Research Objective

Given the current military retirement and benefit system, what system restructuring could achieve increased benefits for the member at a constant (or lower) cost to the government?

1.7 Sub-objectives

1. What is the cost of the current military retirement system (MRS) including both pay and medical benefits?
2. What are the direct costs associated with military health care?
3. What are the CHAMPUS costs associated with military health care?
4. What are realistic (but not quantified) numbers for retirees selecting lump sum payments?
5. What are the projected numbers for retiring personnel used for DoD future planning purposes?

1.8 Overview

This thesis is divided into five chapters. The first chapter is an overview of the problem. It lays out the problem and describes the scope, limitations, objective and sub–objectives of the research. It contains the "big picture."

Chapter 2 is background necessary for the readers understanding of the problem. It contains a brief history of the MRS, a detailed explanation of the current system and an explanation of various other systems suggested in the past. In addition, background is given on health care costs for the military system. This information includes data on both direct care and CHAMPUS costs.

The third chapter contains methodology used to approach the problem. This section includes an explanation of the selected model and the parameters used in the model. Values of parameters are given along with the rationale behind their

selection. Assumptions, data, and references used in the model development are also included. Finally, this section answers some of the sub-objective questions.

Chapter 4 contains the results of the research. The major results are displayed graphically as well as written to aid understanding. Sensitivity analysis is also done in this section.

Finally, Chapter 5 has conclusions and recommendations. The conclusions discuss the findings of Chapter 4. The recommendations serve two purposes. First, ideas and questions brought up by the research, that were beyond the scope of the study, are listed for further research. Second, implementation strategies are included for the proposed system.

II. Literature Review

2.1 Background

During this time of radical change in the Armed Services one thing remains constant — the lack of funds and the popular perception of a "fat" military industrial complex. As national opinion changes from favorable to less than favorable, the military budget shrinks, resulting in reduced funding for manpower. The Military Retirement System (MRS) is a major cost of manpower funding. Review of the MRS began following its inception in 1636 (7:VII-1). As a result, the MRS is constantly in flux. At least twelve major studies recommended substantial changes over the last 35 years. All of these concluded the same thing — the Military Retirement System is too expensive (3:IV-30). Some members in Congress agree. An article in the *Air Force Times* points this out clearly: "Saving money, said committee staffers, became the overriding concern in recommending a change. . . The committee did not discuss the merits of any of the retirement changes"(14:1,8). The following sections discuss the development of the military retirement system focusing specifically on its history, the current system, and three primary areas of ongoing research.

2.1.1 History. The present military retirement system dates back to the Pilgrims at Plymouth Colony. The Colony provided monetary support for any man maimed during war. This support lasted for the rest of the man's life. The first national pension law, passed on August 26, 1776, promised half-pay for the duration of the disability or for life; whichever was shorter (7:VII-1). However, compensation based solely on service time was controversial. Congress promised officers half-pay for life to fight in the war in 1780. The officers served, then fought to collect on that promise. It was not until the Act of August 3, 1861 that voluntary non-disabled retirement was guaranteed. Several changes occurred to this non-disabled pension plan over the years (7:VII-2). Harry White, in a research report for the Air War College, complied a listing of the most important changes (24:10-17).

1. The Act of August 29, 1916 - initiated the formula we use today to establish retired pay entitlements and developed an "up-or-out" promotion plan.
2. The Army and Air Force Utilization and Retirement Equalization Act of 1948 - standardized the retirement system for all Services by establishing an integrated promotion/involuntary retirement system for the Army and the Air Force. This Act formed a uniform retirement authority among all branches of the Service.
3. Officer Personnel Act of 1947 and the Officer Grade Limitation Act of 1954 - provided the promotion and retirement authority for the next 35 years. These laws pertained to mandatory retirement based on length-of-service.
4. The Military Retirement Reform Act of 1986 - affected the computations for retirement pay and only applied to individuals entering active duty after August 1, 1986 (7).

In addition, a major change in Military Retirement System funding occurred with the passing of Public Law 98-94 in 1983. This changed the accounting practice from "pay-as-you-go" to "accrual." Pay-as-you-go accounting budgets retirement expenses when they come due, out of the current available revenues. Accrual accounting sets aside a portion of its current revenues to fund future retirement liabilities (12:1). Due to this accounting change, the MRS greatly affects the military budget. This change requires resources, in particular, funds to be allocated 20+ years before the retirement costs are actually incurred and paid out. Therefore, effective resource allocation becomes even more important.

This is particularly true as life spans increase. The longer an individual lives the more resources he/she is entitled. Thus, increased longevity adversely affects governmental costs. These costs show up in the MRS. Therefore, it is essential to study the MRS and keep it as cost effective as possible. This is especially true in the current environment of drastic military cuts. Studying different alternatives

and then implementing the most desirable could result in monetary savings for the Armed Services. Proper allocation of the savings results in an increase in efficiency in military spending. In other words, we would get more national defense for the same amount of money.

2.1.2 Current MRS. A retired military member's pay is computed as a function of base pay at the time of retirement. This base pay is computed as follows:

- Service member's monthly base pay at retirement if entering active duty before 8 September 80.
- The average of the highest 3 years monthly base pay if entering after 8 September 80 (20:3).

The current MRS has two main groups: military members entering active duty before 1 August 1986 and those entering after this date. The first group, those entering active duty before 1 August 1986, follow these rules:

1. Individuals must have at least 20 years service to draw retirement pay.
2. The service member's multiplier equals 2.5 percent times the years in service of base pay for life, to a maximum of 75 percent of basic pay (30 years of service)
3. The member receives an adjustment to retired pay equal to the percentage increase in the average Consumer Price Index (CPI). This is commonly referred to by the retirees as the cost of living adjustment (COLA).

The second group has reduced benefits due to the August 1986 change. The second group follows these rules:

1. Individuals must have at least 20 years to retire and are encouraged (by the second rule) to stay for 30.
2. The service member's multiplier equals 2.5 percent times the years of service minus 1 percent times the number of years short of 30.

3. The member receives a cost of living adjustment equal to CPI-1%. When the military member reaches age 62, he/she receives a one time restoration to the amount that would have been payable had full CPI been in effect. However, after this restoration, partial COLA continues annually for life.

These multipliers times base pay determine the monthly retirement pay for each group (8:A-2).

	Service Member 1	Service Member 2
Entered Duty	31 July 86	2 Aug 86
Years of Service	20	20
Multiplier	2.5% x20=50%	2.5% x20=50%
Penalty	-	1.0x10=10
Final Multiplier	50%	50-10=40%
Base Pay	2000	2000
Monthly Retirement	2000x50% =1000	2000x40% =800

Table 2.1. Retirement Pay Example

Table 2.1 demonstrates the cost savings to the government and the loss to the individual from the new MRS. For this example, an individual loses $2400 ($200/month X 12 months) a year under the post August 1986 system. In addition, the actual loss would be greater because the table shows only the effect of the multipliers and not the COLA adjustment. Over time, the COLA adjustment becomes a substantial loss to the military member. These changes are in direct response to rising costs. Congress's approach is to continue cutting the MRS to meet fiscal obligations, however, this is not the only way.

2.1.3 Alternatives. Establishing a relationship between age and length of service is one possibility. The Hook Commission recommended such an alternative as early as 1948. They attempted to pattern the Military Retirement System after private industry pension plans. The commission recommended retirement at age 60 with 20-29 years of service or at any age with 30+ years of service. The Interagency Committee (1971), Aspin Retirement Proposal (1976), Uniformed Services Retire-

ment Benefits Act (1979) and the Grace Commission (1983) all recommended similar actions. However, the Fifth Quadrennial Review of Military Compensation (1984) disregarded these recommendations in the best interest of a "quality" force (6:IV-30). In other words, the review concluded it is good for senior military members to retire at 20 years of service to make room for the advancement of younger officers.

White, while at the Air War College, also proposed such a linkage. He compared the Military Retirement System to retirement plans in the civilian sector as well as to foreign military organizations. White cited several reports studying civilian sector versus military retirement benefits. Not surprisingly, the surveys found the MRS allowed members to retire much earlier without age restrictions. In contrast, the universal retirement age in the civilian sector is 65, with provisions to retire at 62. In addition, eighty percent of industrial corporations had a minimum length-of-service tied to retirement age (24:22-25).

White also compared the United States MRS to those of foreign countries. "In each of the countries surveyed, early retirement, at least in comparison with other employment sectors, was considered essential to the well-being of the military. Age was the determining factor, however, and not length-of-service (24:26)." Increasing retirement ages, reduces MRS costs. "The National Center for Health Statistics states the average age expectancy in the US is expected to reach 80 by 2003 (17:1)." Since this is the life expectancy at birth, members reaching retirement age have an even longer life expectancy. Therefore, the current MRS is expected to maintain an individual for 35+ years. By raising the retirement age to 55 (considerably earlier than civilian retirement) the MRS would have only 25+ years of maintenance. This 10 year difference saves billions of dollars. White concludes, "closing the length-of-service gap to one more in line with other military organizations and the civilian sector is an option that deserves pursuing (24:29)."

Peel, in a final report for the Industrial College of the Armed Forces, suggests a second option. The system proposed by Peel would provide

> the same basic provisions as included in the Military Retirement Reform Act of 1986 but would decrease the 20 year early retirement annuity to 30 percent of base pay. This base annuity would then increase by 4.5 percent per year up to a maximum of 75 percent at 30 years . . . This will provide a considerable reduction in the overall cost of the retirement program and will provide greater incentive to remain on active duty beyond the 20-year minimum retirement. (20:14)

In addition, Peel recommends establishing a service bonus program to offset this reduction in retirement benefits.

> The service bonus would consist of a one-time lump sum payment upon separation, based on 50 percent of monthly base pay times the number of total years service. This program would begin at 12 years active service and continue to the 25 year mark. (20:14)

This resembles the "vesting" procedure used by the civilian sector. A civilian employee is vested after a certain number of years working for the employer. This vestment assures the employee of at least limited retirement benefits or a lump sum of money upon leaving the company. This alternative, with the service bonus, is designed to keep the most competitive personnel while compensating others for their service.

A third alternative, researched separately by Henry and Newman, proposes funding the Military Retirement System through investment in the private sector (11, 18). Instead of reducing benefits, this alternative devises a procedure to retain the current benefit level. The MRS fund currently uses Treasury bonds to gain interest on the money. This option would invest the money in the private sector in stocks, bonds and/or mutual funds. The value of the MRS fund could then grow considerably over time. Of course, investing MRS money in the private sector is risky. There exist, however, methods to control the risk. "There is enough historical evidence based on other studies that show investments in the stock and bond markets, over a long period of time, guarantees a higher rate of return than simply investing in Treasury bonds (18:82)." In addition, investment plans including stock never return less than a plan that consists only of Treasury securities. This suggests that although

a higher rate of return for private sector investing cannot be guaranteed, it almost certainly will not provide a lower return over a long period (18:84). Therefore, the current benefit level is maintained through the growth in the fund.

However, all these alternatives look at the MRS from the government's point of view. How could the military retirement system be changed to keep cost constant for the government *while* improving individual benefits? Individual military members have many concerns about the MRS. Some of these include the following questions:

- How do the shrinking benefits affect my retirement?
- Do I want to have a military career knowing that my retirement benefits are in jeopardy?
- Why can't I get my money all at once and invest it myself?
- I do not want to live by a base when I retire so how beneficial is the health care system to me?
- My company has a health insurance plan that offers better benefits and is cheaper than CHAMPUS. I'm not using my health care benefit. Therefore, it is not a benefit to me.

This thesis will address these questions. To do this properly, background information is needed on the military health care system.

For many years, military members have enjoyed unlimited and free medical benefits. However, these benefits are shrinking and will continue to shrink as the military and the nation struggle to bring health care costs under control. Economic and political realities are making it hard to continue these medical benefits at the current level. Bob Hale, assistant director of the National Security Division of the Congressional Budget Office had this to say to Congress on the costs of the military health care system:

> In 1992, the Department of Defense (DoD) will spend more than $15 billion on health care, including more than $10 billion that is directly

> related to delivering peacetime medical services . . . the Congressional Budget Office projects that, under the Administration's plan for personnel cuts, spending on peacetime medical services would increase to $12 billion between 1992 and 1997 — a five year jump of 17%. Over that same period, the total budget for national defense would increase by only about 2.4% to about $291 billion. (10:27)

These costs must be brought under control. Therefore, Congress has tended to focus its attention on reducing CHAMPUS costs. CHAMPUS is the Civilian Health and Medical Program of the Uniformed Services. This program reimburses health care providers for services provided to beneficiaries under the age of 65. In other words, CHAMPUS is a traditional insurance plan that picks up the majority of the beneficiaries' medical costs. Of the $15 billion spent in 1992, $3.7 billion were CHAMPUS costs (10:27).

What does this $3.7 billion buy the American taxpayer (and the military member/family)? To answer this question, the reader needs to understand how the military health care system and CHAMPUS operate. Active duty members are always treated first in military facilities. Treatment of others comes only if medical staff and resources are available. This is referred to as a "space available" basis. If space is available, the priority list is as follows:

1. Active duty dependents
2. Dependents of reservists on active duty
3. Retirees, retiree dependents and survivors of active duty and retirees

If space is not available, the person seeking medical treatment is referred to a civilian facility. This is when CHAMPUS is used.

CHAMPUS is a health insurance policy set up and paid for by the government to cover the following individuals:

1. Husbands, wives, and unmarried children of active duty service members

2. Retirees, their husbands or wives and unmarried children

3. Unremarried husbands and wives and unmarried children of active duty or retired service members who have died

4. Husbands, wives and unmarried children of reservists who are ordered to active duty for more than 30 days or reservists who die on active duty

5. Former spouses of active or retired military who were married to a service member or former member who had performed at least 20 years of creditable service for retirement purposes at the time the divorce or annulment occurred. The former spouse must also meet certain other requirements (2:15-16)

Note that active duty members are not entitled to CHAMPUS benefits because all their needs are to be met by the military system.

In addition, as discussed above, CHAMPUS is a cost-sharing plan. The individual/family pays a deductible and then a certain portion of the cost thereafter for outpatient care. Inpatient care has no deductible but daily charge rules. Table 2.2 shows the deductibles and charges for military and civilian care (2:81-82).

Military Hospitals			CHAMPUS		
Patients	Inpatient	Outpatient	Inpatient	Outpatient	Deductibles
Active duty families	\$8.95	\$0	\$8.95/day or \$25, whichever is greater	After deductible, 20% of charges	\$150/individual \$300/family
Retirees and their families	\$8.95	\$0	25% of billed charges or \$241/day whichever is less	After deductible, 25% of charges	same as above

Table 2.2. CHAMPUS Summary

As the reader can discern, CHAMPUS costs for retirees and their families can be considerably more expensive than for active duty families. Many retiring military members are not aware of this fact nor are they aware of age limitation on CHAMPUS benefits. In fact, in his thesis, Jordan states "that an alarming percentage of military

retirees appear to have very little knowledge of Medicare and CHAMPUS regulations and practices (15:38).

Finally, CHAMPUS coverage automatically ends when a participant turns 65 because they become eligible for Medicare. Therefore, military retirees and families lose CHAMPUS privileges at 65 or when there is ineligibility for some other reason. However, the retirees and their dependents keep the privilege for treatment in military hospitals (16:15).

Now that the system is understood, where can Congress look to cut cost? In Hale's presentation to Congress, three possible policy changes were mentioned. However, none of these could guarantee results in today's uncertain environment. Hale suggested that the only solution

> to substantial savings may ultimately require a broader restructuring of the system . . . Such a restructuring would raise some tough questions. Should all beneficiaries, especially retirees and their dependents, be allowed unlimited access to military treatment facilities at little or no cost? Should military beneficiaries carry a larger share of the cost burden through increased deductibles and copayments, or through health insurance premiums? Congress may have some answers to the questions when the DoD completes its comprehensive study of the military medical care system. (10:30)

These questions have led many military members to reconsider their perceptions of their health care benefit. Orend and Rosenblatt completed a study on military health care users. They determined several interesting facts. First, as one can see in Table 2.3, about 40% of retirees, their dependents and survivors use other insurance plans besides CHAMPUS.

Orend and Rosenblatt went on to determine why such large numbers of retirees did not use their health care benefit. Table 2.4 displays these reasons. As many people suspected, military members go on to different jobs when they "retire." These new jobs often have free and/or better medical plans. The retiree is looking for the least expensive most beneficial plan. It is interesting to note that 40% of the retirees

Family Beneficiary Class	Percentage Using Non CHAMPUS plans
Active Duty	12.1
Retired	40.2
Survivors of Active Duty	33.4
Survivors of Retirees	40.3

Table 2.3. CHAMPUS Usage figures

do not believe direct care and CHAMPUS is their best bet. In other words, 40% of the retiree population would like an alternative to the health care benefit.

Beneficiary Class	Free or Automatic	More Benefits Desired	Fear of Reduced Benefits	Dissatisfied with Military	Too Far from Base	Other Reasons
Retired	45.6	30.2	2.0	6.3	5.4	10.5
Survivors of Retirees	16.8	37.6	3.0	3.0	10.9	28.7

Table 2.4. Reasons for Non-CHAMPUS Usage

2.2 Summary

The military retirement system is always under attack for costing too much. History has shown that MRS costs will continue to grow each year. This is unacceptable since the DoD budget will continue to shrink. In addition, military members feel their benefits are always under attack and that their sacrifices are not appreciated. Also, many of the retirees do not use their health care benefit because it is not regarded as a benefit for various reasons. Therefore, a restructuring of the MRS is one option to contain these rising costs and increase retiree satisfaction. Chapter 3 will examine a methodology for restructuring the MRS. The costs to the government versus the benefits to the individual will be compared.

III. Method

3.1 Introduction

History has shown that the Military Retirement System (MRS) has been subjected to numerous changes. Some of these changes have increased benefits, while some have decreased benefits. In the recent past, the MRS benefits have been cut. These cuts have resulted in reduced take home pay for retirees. In addition, current political leaders are considering more cuts to reduce the overall costs to the government of military retirement benefits. However, these proposed cuts include cost reductions *within* the guidelines of the current MRS. This chapter describes system restructuring as an alternative approach to cutting costs.

System restructuring would change the emphasis from cutting benefits to keeping costs constant (or lower) with a equal (or greater) benefit level. This restructuring approach is based on four options. The retiree, at his/her time of retirement, would select one of these options. The options are outlined below.

1. Current System—this system provides a pay annuity for life and yearly health care until the member reaches 65. In addition, the retiree's family receives health care as long as it remains eligible (see Chapter 2, eligibility requirements).
2. Pay lump sum—the retiree would receive a lump sum of money in place of the pay annuity. The retiree and family would still be entitled to military health care.
3. Medical lump sum—the retiree would receive a lump sum of money in place of the health care benefit. He/she would still receive the pay annuity.
4. Both lump sums—the retiree would receive a lump sum for both the pay annuity and the medical benefit.

The following sections outline the proposed approach to the problem, the model description, employment of the model, and sensitivity analysis.

3.2 Approach

The measurement of costs is the basis of this research. Costs include both the pay annuities and the health care benefit. Because data is not available for the present system, a model was used to estimate these costs. A model was also used to calculate the costs of the proposed system. Since the proposed system included a percentage of people selecting the current system, both models needed to "overlay" or share the same data. Once the costs were calculated for each system a comparison between the two was required. The cost comparison constitutes the heart of the research – if the proposed system is more economical than the current system, it deserves further study. Otherwise, a new system should be proposed. The comparison is the measure of effectiveness, in dollars, of the proposed system. A secondary measure of effectiveness pertains to the comparison of individual benefit levels between the two systems. As with costs, the benefit levels are measured in dollars. In other words, a benefit level refers to how much money an individual would get if he/she selected the pay option at a 75% lump sum amount. Since the costs are incurred at various times in both systems, a present worth analysis is used to compare systems on the basis of cost and benefit dollars.

A spreadsheet was chosen as the platform on which to build the model. The spreadsheet had to be able to "share" data between systems, calculate their respective present worths and permit comparison of outputs. Quattro Pro was chosen because of its availability, ease of use, and compatibility with the features of other spreadsheet programs.

3.3 Model

Once the software was chosen, the model building could begin. The first objective was to determine the costs of the current system. The current system costs would include only personnel retiring under the post August 1986 system. The model building process was iterative, and ultimately, the model evolved to that shown in Figure 3.1.

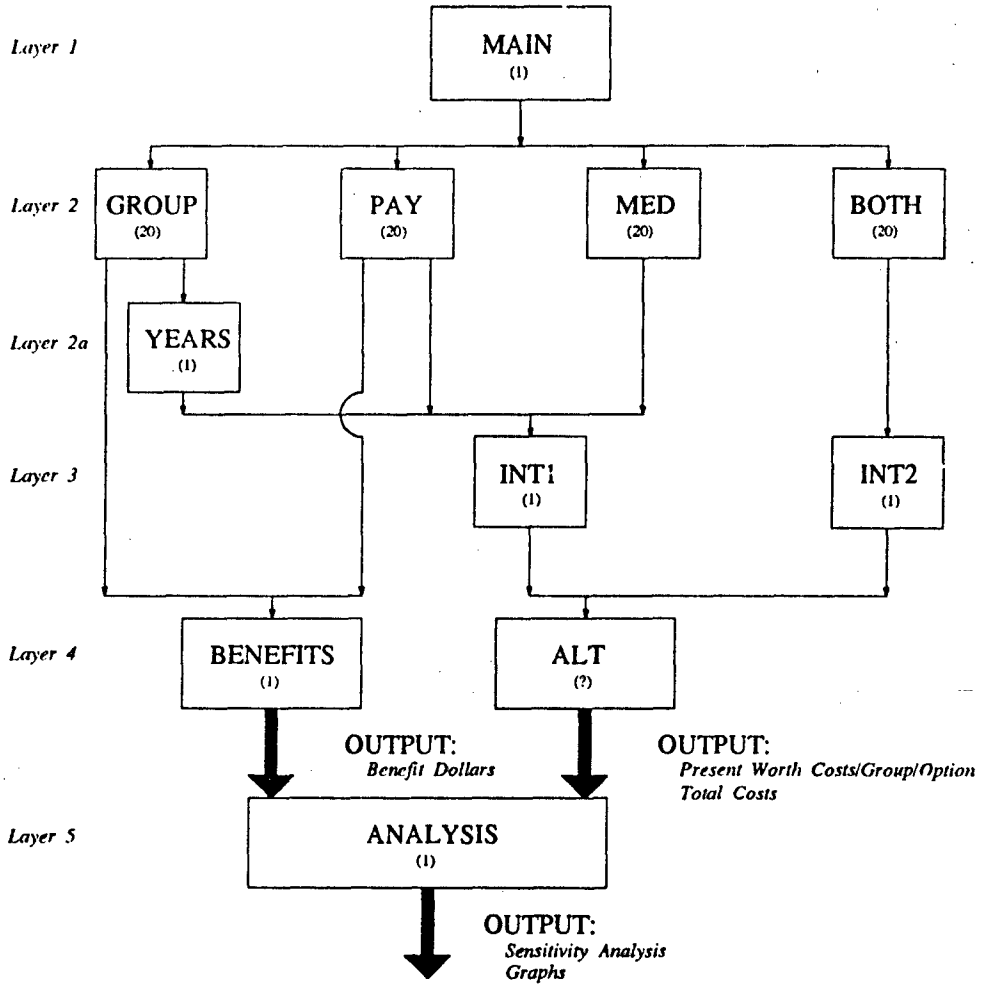


Figure 3.1. Model Overview

Layer 1 holds all the information to be shared by other spreadsheets. Layer 2 and 2a perform the majority of cost computations. Layer 3 contains the results of interim computations necessitated by software/hardware limitations. Layer 4 prepares the results for presentation by layer 5. Each layer is described in more detail in the following sections.

Each box in Figure 3.1 represents a set of spreadsheets. The text in the box is the name used to reference those spreadsheets. The numeral under the name indicates the number of spreadsheets in that set. For example, in layer two, there are twenty spreadsheets in the GROUP set. BENEFITS, ALT and ANALYSIS are the spreadsheet sets that output all the data. For clarity purposes, all spreadsheet set names will be capitalized.

3.3.1 MAIN Spreadsheet. Layer 1 has one spreadsheet named MAIN. MAIN is the spreadsheet that contains the data to be shared by layer 2. Figure 3.2 shows a block diagram of the pertinent information in Thesis2.

The percentage of personnel selecting each option are constants that are changed for sensitivity analysis. The percentage selecting all four options must equal one. Similarly, the lump sum percentages are constants that can also be changed (see section 3.14 for further details). The number of dependents per retiree is a constant value. This value is used in determining health care costs. Stark, at DEERS in Monterey CA, in collaboration with Orphin, states that the number of dependents per retiree is currently 1.15 (23). However, since people are having children later in life and to offset another assumption (see page 3-19), a value of 1.5 was used in the model. This increase ensures worst case calculations for cost. In other words, the proposed options will have inflated cost values.

The fourth block contains health care cost values. These values were based on information provided by Scheidt and Anderson of the Managed Health Care (SGC) Office at Wright Patterson AFB, OH (1). The data provided was for region

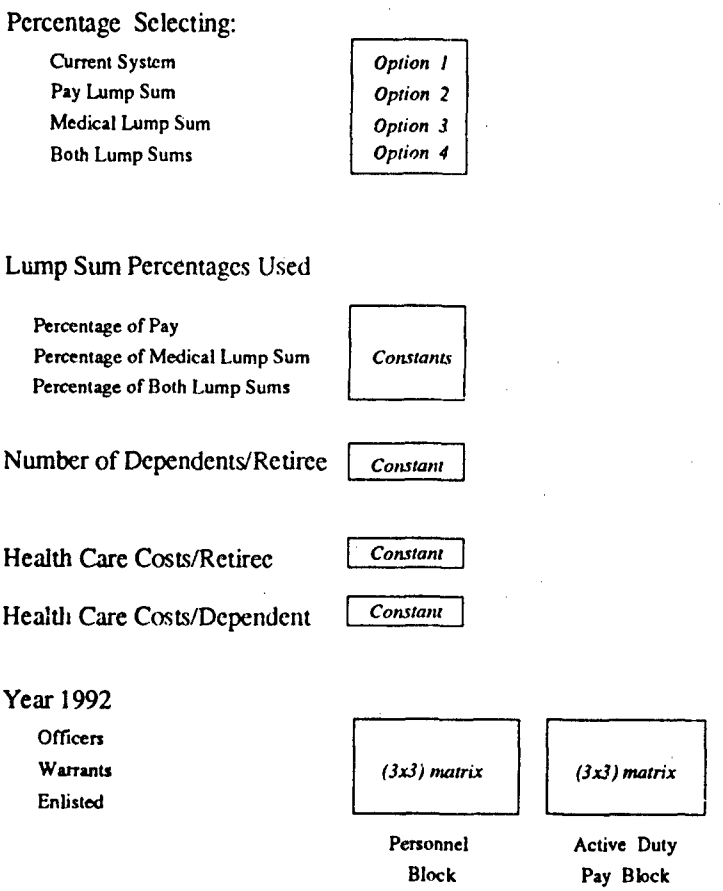


Figure 3.2. MAIN Spreadsheet Layout

six. Though the military has nine regions and five separate operating locations, an assumption was made that all regions have the same average costs per retiree or dependent. A cost report from CHAMPUS was acquired which showed substantial cost differences (on average) between regions. This report included all CHAMPUS beneficiaries not only retirees and their families. The data had a maximum cost of $1238 per patient, a minimum cost of $502 and a standard deviation of $272. Region six was within one standard deviation of the mean. Unfortunately, it was impossible to take this information and break it down to just retirees and their dependents. Therefore, only region six data was used to arrive at the health care figures. Because the average cost for region six was approximately equal to the average cost of all regions combined, it is possible that the results will be representative of all regions. Therefore, the assumption was considered valid for this model.

The values in Table 3.1 were used to determine weighted average health care cost per year for retirees and dependents, respectively. Equations 3.1 and 3.2 calculate the weighted average inpatient health care cost for dependents and retirees, respectively. Equations 3.3 and 3.4 calculate the weighted average outpatient health care cost for the same two groups.

$$\begin{aligned} \textit{Inpatient Dep} &= \frac{875.98 * 1944 + 3948.55 * 2058}{1944 + 2058} \qquad (3.1) \\ &= 2456 \\ \textit{Inpatient Ret} &= \frac{875.98 * 2083 + 5080.08 * 1268}{2083 + 1268} \qquad (3.2) \\ &= 2467 \\ \textit{Outpatient Dep} &= \frac{111.16 * 75522 + 416.12 * 19889}{75522 + 19889} \qquad (3.3) \\ &= 175 \\ \textit{Outpatient Ret} &= \frac{111.16 * 57012 + 471.37 * 10055}{57012 + 10055} \qquad (3.4) \\ &= 165 \end{aligned}$$

	Average Costs per Individual	Number Using Service per Year
Dependents		
Military Facility		
Inpatient	$875.98	1944
Outpatient	$111.16	75522
Drugs	$30.52	—
CHAMPUS		
Inpatient	$3948.55	2058
Outpatient	$416.12	19889
Retirees		
Military Facility		
Inpatient	$875.98	2083
Outpatient	$111.16	57012
Drugs	$30.52	—
CHAMPUS		
Inpatient	$5080.08	1268
Outpatient	$471.37	10055

Table 3.1. Medical Cost Data: Direct and CHAMPUS

These four weighted average costs are then used below to calculate the overall health care cost per dependent and retiree, respectively.

$$
\begin{aligned}
Dep &= 2456 * \frac{1944 + 2058}{1944 + 75522 + 2058 + 19889} + 175 * \frac{75522 + 19889}{1944 + 75522 + 2058 + 19889} + 30.52 \\
&= 297 \\
Ret &= 2467 * \frac{2083 + 1268}{2083 + 57012 + 1268 + 10055} + 165 * \frac{57012 + 10055}{2083 + 57012 + 1268 + 10055} + 30.52 \\
&= 305
\end{aligned}
$$

The resulting health care values used in the model were $297 per dependent and $305 per retiree.

Finally, the numbers of personnel numbers and active duty pay amounts were acquired through the Office of the Actuary, which collects personnel data related to

retirees. The *DoD Statistical Report on the Military Retirement System* projects the number of people retiring and their ranks for fiscal year 1991 (5:150). These numbers were used to estimate the retiree population for each year in the model. The active duty pay numbers were taken from the basic pay chart in the *Federal Employees Almanac*. This chart lists basic pay rates effective 1 January 1992 (13:34).

The initial approach to calculating retired pay and health care is described below. This approach was eventually condensed as described following the initial approach. Both the personnel numbers and the active pay numbers were broken out according to individual ranks. The personnel numbers were combined into three columns. The first column contained anyone who retired at 20 years. The second column contained the sum of the personnel who retired between 21-25 years. The third column was the sum of the personnel retiring after 26 years. The active duty pay columns used 20, 22, 26 years respectively to correspond with the retirement year columns. The retirees with 20 years of service retire with the active duty pay amount figured at the twenty year point. Retirees with 21 - 25 years are assumed to retiree with 22.5 years of service. Thus, these retirees use an active duty pay amount corresponding to the 22 year point. Finally, retirees with 26+ years are assumed to retiree on average with 27.5 years of service. However, individuals receive maximum allowed active duty pay at the 26 year point. Therefore, the amount at 26 years was used as the active duty pay figure. Figure 3.3 shows the layout of this initial spreadsheet.

A cost analysis was performed on this spreadsheet for one year. Each grades cost was individually calculated using equation 3.5.

$$Cost/grade = (A * D * mult20) + (B * E * mult25) + (C * F * mult30) \qquad (3.5)$$

Grade	Numbers Retiring			Active Pay		
	20 yrs	21-25 yrs	26+ yrs	20 yrs	22 yrs	26 yrs
O-10						
O-9						
O-8						
O-7						
O-6						
O-5						
O-4						
O-3						
O-2						
O-1						
W-4	A	B	C	D	E	F
W-3	G	H	I	J	K	L
W-2	M	N	O	P	Q	R
W-1	S	T	U	V	W	X
E-9						
E-8						
E-7						
E-6						
E-5						
E-4						
E-3						
E-2						
E-1						

Figure 3.3. Expanded Categories Spreadsheet

where mult20, mult25 and mult30 are multipliers used to calculate the appropriate retired pay values. Mult20, mult25 and mult30 are calculated using equations 3.6 through 3.8. Note that mult25 and mult30 cover time periods, 21-25 and 26+ years, respectively. Therefore, the midpoint was used in the calculations of these multiplier values. The cost calculations were performed for each rank and all results were summed to get a total cost.

$$
\begin{aligned}
mult20 &= 20 * .025 - [(30 - 20) * .010] \qquad (3.6)\\
&= .50 - .10\\
&= .40\\
mult25 &= 22.5 * .025 - [(30 - 22.5) - .01] \qquad (3.7)\\
&= .5625 - .075\\
&= .4875\\
mult30 &= 27.5 * .025 - [(30 - 27.5) * .01] \qquad (3.8)\\
&= .6875 - .025\\
&= .6625
\end{aligned}
$$

However, because of the size and extensive calculations involved, this approach seemed unrealistic to continue for twenty years. A smaller number of ranking groups might yield accurate results without the massive size of considering all the ranks. To check this assumption, another cost analysis was run using only three ranking groups: officers, warrant officers and enlisted. The officer personnel numbers were summed in each column individually to get three new officer retirement numbers. This was repeated for the warrant and enlisted ranking groups. Finally, the active pay numbers were combined again using a weighted average approach. This is shown

mathematically in equation 3.9 for the warrant officers (W-4).

$$Warrant/20yrs = \frac{(A * D) + (G * J) + (M * P) + (S * V)}{A + G + M + S} \tag{3.9}$$

This was repeated nine times to get an average pay figure for each (row, column) combination. The final form is shown in Table 3.2.

	Personnel Numbers			Active Pay Averages		
	20	21-25	26+	20	22	26
Officers						
Warrant						
Enlisted						

Table 3.2. Personnel and Pay Matrix Form

The smaller ranking group approach was then compared to the full ranking group solution. The full ranking group solution was considered the target value, since, theoretically it should calculate costs more accurately (there is no averaging among groups). The results of the comparison was very favorable. The smaller ranking group produced a cost value less than 1% from the full ranking group method. Therefore, it seemed unnecessary to keep the complexity added by the full ranking group method. The smaller ranking group was implemented in the final model and Figure 3.2 displays the final matrix form used.

One thing remained to be resolved. The personnel numbers pertained to 1991, while the pay data was for 1992. To adjust for the difference in the base years, another report from the Office of the Actuary was used. The *Valuation of the Military Retirement System* report projects numbers of retirees for 1992-2041 (8:M-6). These projections showed the 1991 figures were slightly less than the 1992 figures. Since this table only did overall projections, a break-out of officers, warrants and enlisted was not available. Therefore, to correct the personnel numbers, two assumptions were made. One assumption made was that the relative proportions of officers,

warrant and enlisted are constant. Also, it was assumed that proportions within age groups (20,21-25,26+) remain constant. Accordingly, the 1991 figures were adjusted to agree with the 1992 figures.

The next step in the model building process was to calculate the costs of the current retirement system. The associated spreadsheet sets will be discussed one at a time. Each set will have two major figures. The first figure will be a block diagram of the layout of the spreadsheet and the second figure shows the spreadsheet calculations. The italics inside the boxes refer to the file or appendix where the data is located. The letters inside the box represent a constant, several constants or a matrix. The two figures will always be displayed together with the block diagram first, followed by the calculations. In spreadsheets that have multiple pages, the two figures will be interleaved (except for the GROUP spreadsheet which will discuss the entire block diagram before the calculations).

3.4 GROUP Spreadsheets

GROUP, in layer 2, calculates the real-dollar costs of the current retirement system during the appropriate twenty year period, and YEARS, in layer 2a, discounts these costs to present worth. The spreadsheet set, GROUP, consists of twenty individual spreadsheets. Each spreadsheet represents a group (set) of retirees. The first group retires in 1992, the second group in 1993, until the last group, group 20, retires in 2011. Each group receives retirement pay and health care benefits for twenty years and then is considered "out" of the system for this study. This twenty year study period was chosen to reduce complexity. However, a more reasonable time period may be 30 plus years as life spans increase. The general block diagram for the GROUP spreadsheet set is shown in Figures 3.4 and 3.5. Figures 3.6 and 3.7 show the corresponding calculations used in the spreadsheets. The reader should reference both figures because the blocks are labelled for easy reference in the calculations diagram only.

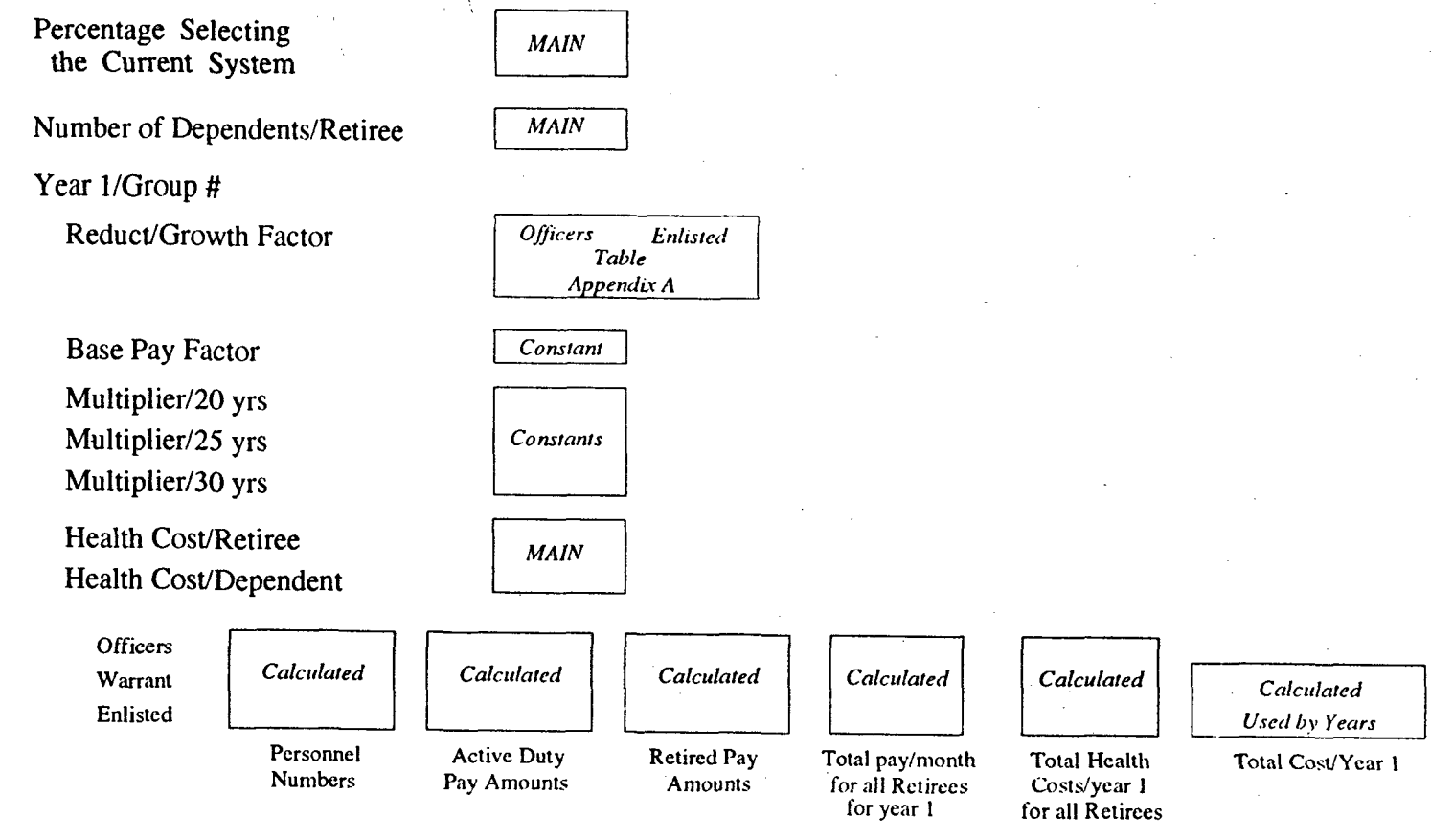
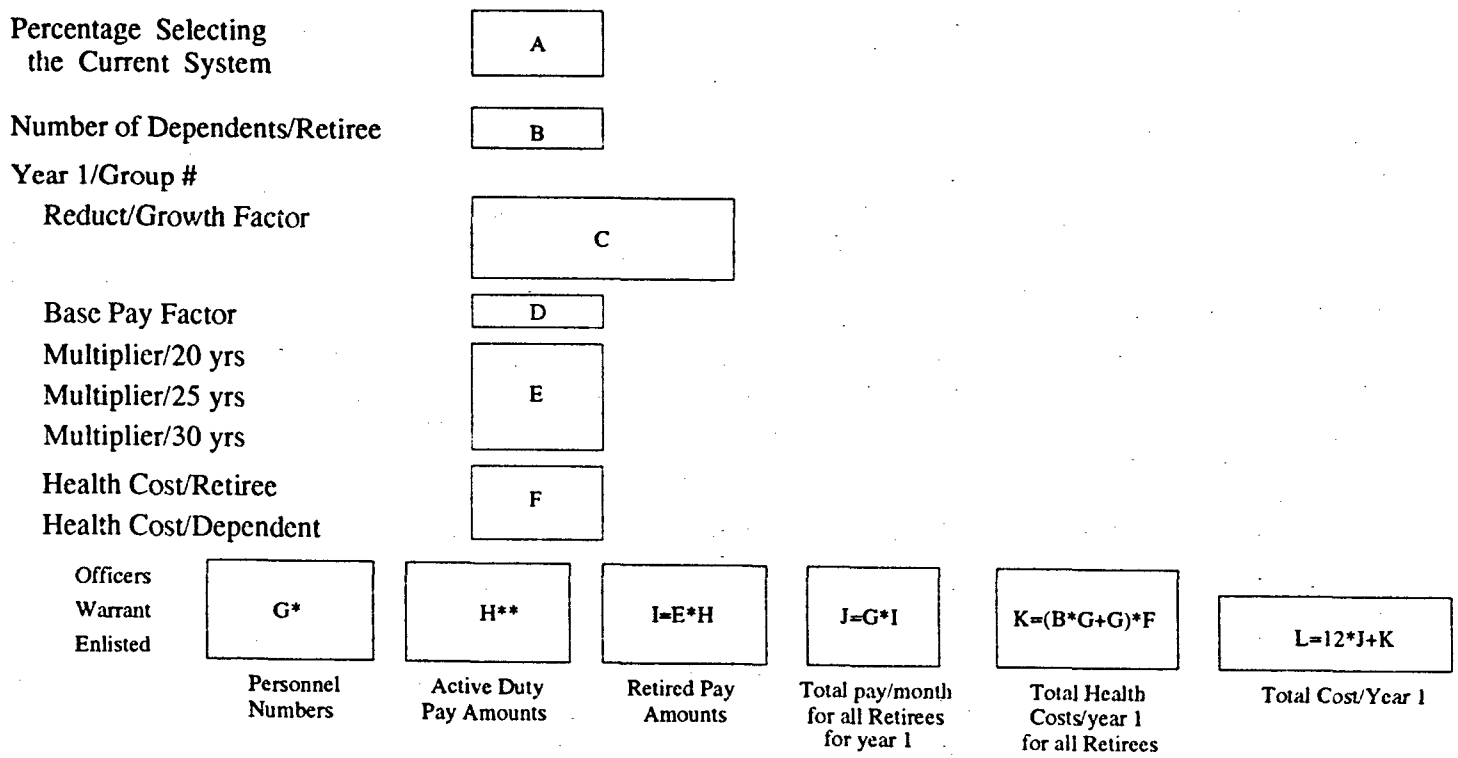


Figure 3.4. GROUP Spreadsheet Layout: Part 1



*G=A*C*[THESIS2]PERSONNEL BLOCK

**H=(D^GROUP NUMBER-1)*[THESIS2]ACTIVE PAY BLOCK

Figure 3.5. GROUP Spreadsheet Calculations: Part 1

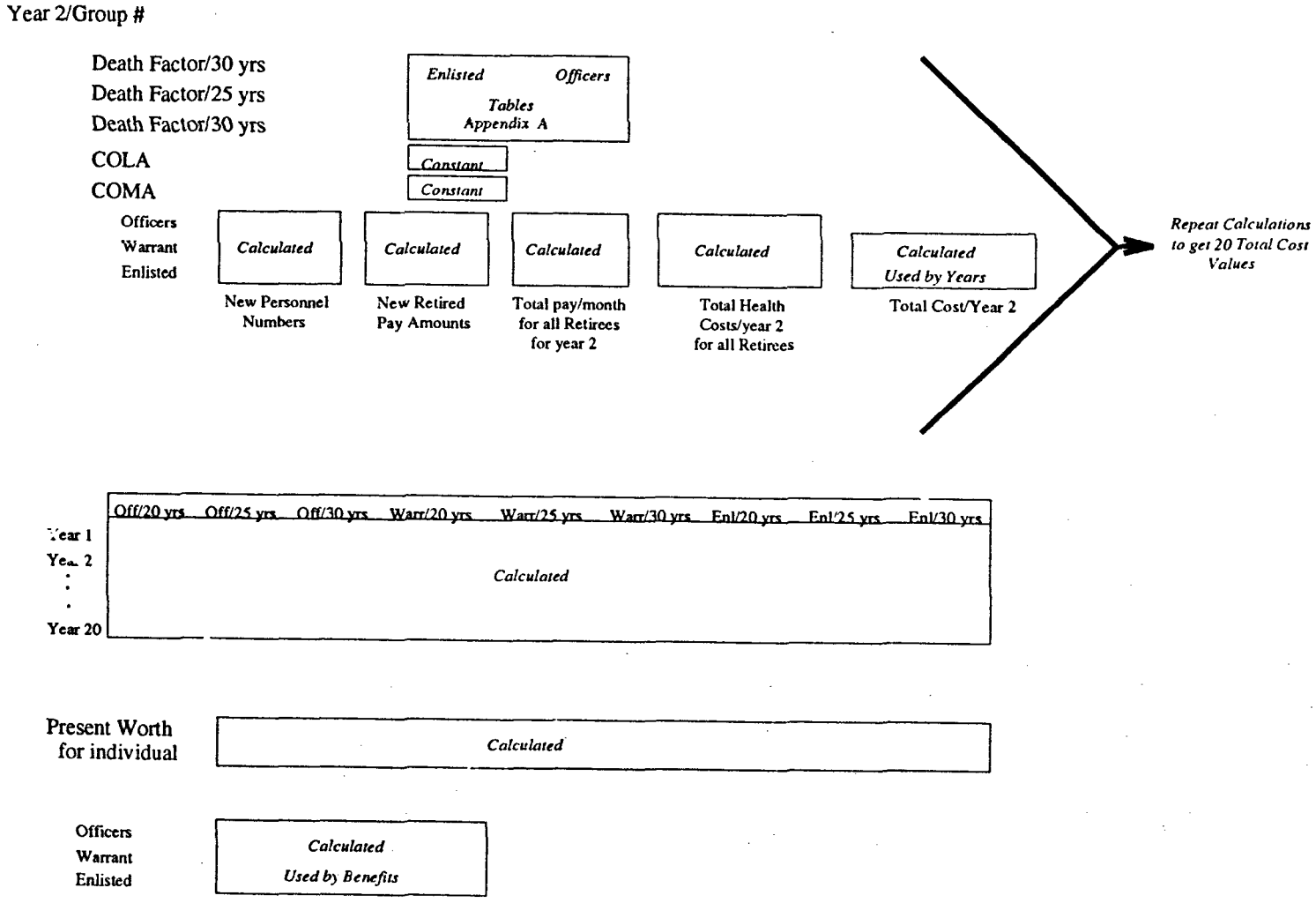


Figure 3.6. GROUP Spreadsheet Layout: Part 2

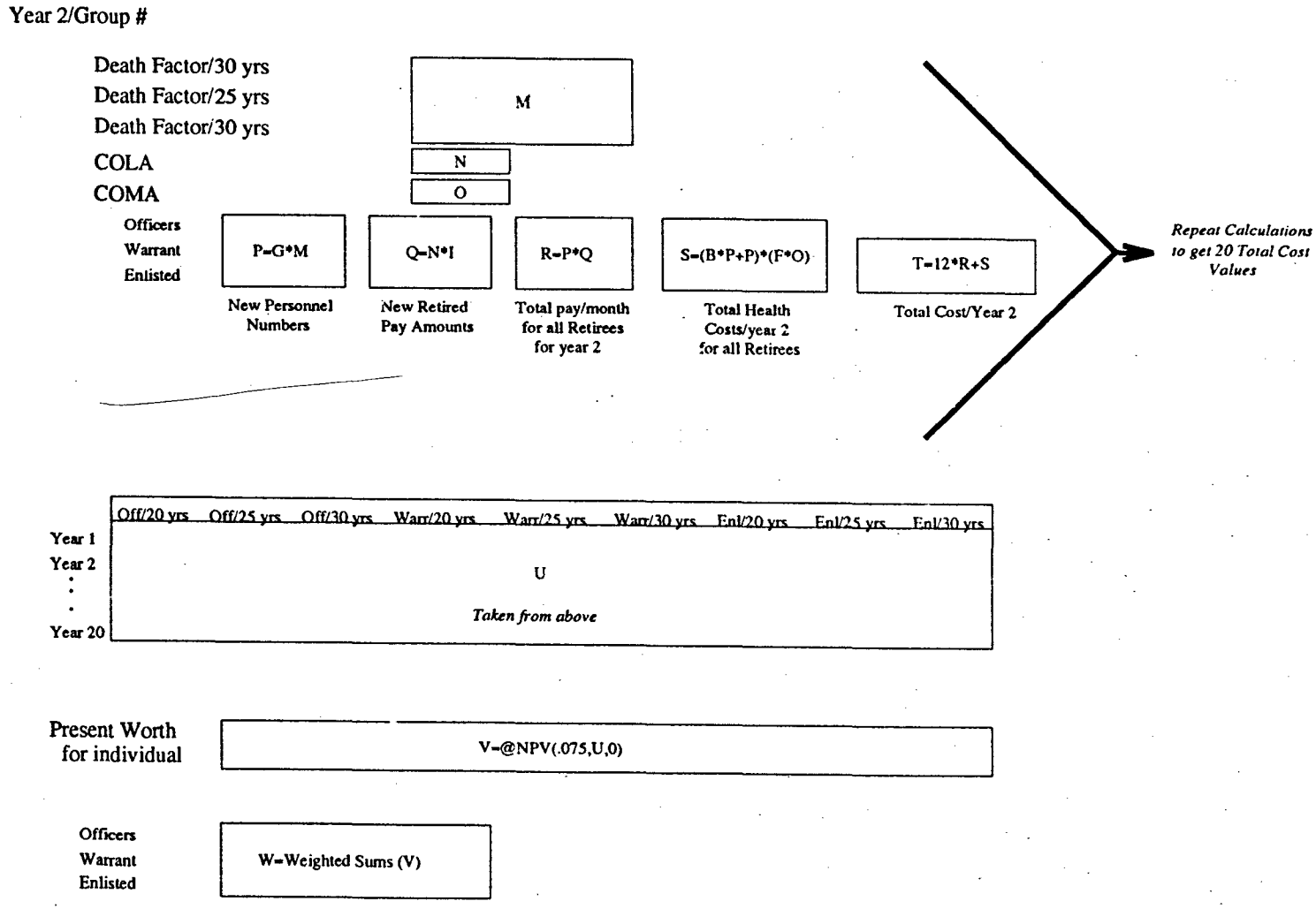


Figure 3.7. GROUP Spreadsheet Calculations: Part 2

Block A in Figure 3.6 expresses the percentage of personnel selecting the current system. The percentage is acquired from the MAIN spreadsheet, along with the number of dependents per retiree. Block B is the number of dependents each retiree has on average and it is retrieved from MAIN. Block C contains the reference to a table in Appendix A. This table was created to predict the growth/reduction in personnel numbers from year to year. Since officer and enlisted numbers vary greatly, a separate factor was used for each group. For purposes of this table warrant officers are grouped with officers. A difference (positive or negative) was computed between the projections in the retiree year and the base year of 1992. This difference was expressed as a fraction of the base figure and then added to one. The base figure is the number of officers or enlisted retirees in year 1992. The result is the reduct/growth factor. A number less than one indicates a smaller number of retirees for that year compared to 1992. A number greater than one indicates a larger retiree population. An example calculation is shown in Appendix A along with the table.

Blocks D, E, and F are constants. The base pay factor increases active pay dollars to account for annual cost of living increases. This factor is shown in Equation 3.10 where $n = group\ number - 1$.

$$BasePayFactor = 1.055^{n} \tag{3.10}$$

Thus, GROUP4 has a base pay factor equal to $(1.055)^{(4-1)} = 1.174$. The 1.055 represents the approximate average rate of change of active duty pay every year. This value was chosen using the Actuary data provided in the *Valuation of the Military Retirement System* (8:20). The report predicts base pay to increase by 5.5% every year. Block E contains the retirement pay factors under the current system. These pay factors (multipliers) are calculated using the rule which states the service member's multiplier equals 2.5 percent times the years of service, minus 1 percent

times the number of years short of thirty. Finally, Block F contains the health care costs for the retiree and a dependent (separately).

The retired pay factors employed in Block E are calculated in equations 3.6 through 3.8 which were displayed earlier. Recall that mult25 and mult30 cover time periods, 21–25 and 26+ years, respectively. Therefore, the midpoint was used in the calculation of the multiplier values.

Blocks G through L, in Figure 3.5 calculate the actual year 1 costs for the current system. Retired deaths have to be considered in the model. The death factor block, shown in Figure 3.7, reduces personnel numbers by the appropriate amount. These constants are shown in the Death Rate Tables in Appendix A, which is based upon the Actuary Report (8:K4–K7,J2–J5). It is assumed that officers and warrant officers retire on average at age 43 and that enlisted retiree on average at age 40. Deaths are assumed to occur at the end of the year. Therefore, every retiree collects at least one year of MRS benefits.

The COLA block, Block N in Figure 3.7, is the cost-of-living-adjustment a retiree receives to the retired pay amount. These values have been projected by the Actuary and are shown in Table 3.3 (8:20).

Year	COLA
1992	3.7
1993	3.0
1994	3.2
1995	3.2
1996	3.2
1997	3.1
1998	5.0
beyond	5.0

Table 3.3. COLA Factors

However, COLA for these retirees must be reduced by 1% under the post August 1986 system (see section 2.1.2). Under this system, retirees receive only

partial COLA until age 62 when they receive a one-time restoration of their pay to the level it would have been had full COLA been in effect. This restoration calculation (jump in pay) is included in the model for members reaching age 62.

Finally, an adjustment to the health care costs also has to be made to account for inflation. This value would have to be set by Congress along with the COLA. This could be called the cost-of-medical-adjustment (COMA). The assumed value of COMA in this study is 7%. This value was chosen because the Congressional Budget Office projects medical prices to increase at a rate of about 7% a year (10:27). The COMA is used to calculate the costs of medical care over the twenty year period and is stored in Block O.

The military health care system stops paying medical benefits when beneficiaries reach the age of 65. These beneficiaries are eligible to receive direct (military) care but are not entitled to CHAMPUS benefits any longer. For purposes of modeling, these members and their families are deleted from the health care costs calculations. This yields an underestimate of true costs because family members are entitled to CHAMPUS care until age 65 or disqualification for other reasons. To compensate for this underestimate, the number of dependents per retiree was increased from 1.15 to 1.5. Unfortunately, there is no way to verify the accuracy of this adjustment because no data was available on retention of the family in the CHAMPUS system after the retiree reaches age 65. Increasing the number of dependents per retiree ensures that the costs of proposed alternatives are not underestimated. If a proposed alternative shows a reduction in cost compared to the current system, then the government is assured of *at least* that amount of cost savings.

The final area of the spreadsheet, Blocks U-W in Figures 3.6 and 3.7, calculates values needed by the BENEFITS spreadsheet. Twenty total pay per year numbers are collected and arranged in a column of the spreadsheet. These pay per year numbers are for one individual; officer with twenty years, officer with 25 years etc. A present worth value is calculated for each category with a discount

rate of 7.5%. The numbers for the officers are then averaged using a weighted sums approach. The final block, W, is the benefit dollars for the average officer, warrant officer, or enlisted retiree. This dollar value is the value at the 100% lump sum figure. In other words, this is the dollar figure a retiree would receive if he/she chose option 1 under the proposed system. These three values are then used by BENEFITS.

Now the calculations for the GROUP spreadsheet will be discussed. Blocks A-F are all constants. Block G is the number of retiring personnel for that year. This calculation takes into account the number selecting the current system as well as the growth or reduction in force size from base year 1992. Block H calculates the active pay values at the time of retirement (year 1). It accounts for inflation from the base active pay figures. Both G and H are (3X3) matrices as depicted in Table 3.2.

Retired pay is just the product of active pay and the appropriate multiplier, summarized in Equations 3.11 through 3.19. This generates the data elements of a (3X3) matrix.

$$Officers/20yrs = H_{(1,1)} * mult20 \quad (3.11)$$

$$Officers/25yrs = H_{(1,2)} * mult25 \quad (3.12)$$

$$Officers/30yrs = H_{(1,3)} * mult30 \quad (3.13)$$

$$Warrants/20yrs = H_{(2,1)} * mult20 \quad (3.14)$$

$$Warrants/25yrs = H_{(2,2)} * mult25 \quad (3.15)$$

$$Warrants/30yrs = H_{(2,3)} * mult30 \quad (3.16)$$

$$Enlisted/20yrs = H_{(3,1)} * mult20 \quad (3.17)$$

$$Enlisted/25yrs = H_{(3,2)} * mult25 \quad (3.18)$$

$$Enlisted/30yrs = H_{(3,3)} * mult30 \quad (3.19)$$

Total pay per month for each group (officers, warrants, enlisted) is then obtained as the product of the number of personnel in the group and the retired pay rate. This can be conveniently summarized in a 3 X 1 matrix.

Health care costs are calculated by taking the number of dependents per retiree times the number of retirees to get the total number of dependents. The dependent portion of total health care costs is then calculated as the product of the number of dependents and the average dependent health care cost ($297) calculated earlier. The health care costs for retirees is the product of the number of retirees and average retiree health cost ($305). Subsequently, the total health care cost is the sum of the dependent and retiree costs (see Figure 3.7).

Finally, the total cost for year 1 equals twelve times the total pay per month plus the health care costs. This figure is used by YEARS to calculate an overall cost for the group. Preceding from year 1 to year 2 requires two steps. First, new personnel numbers are calculated by multiplying the old personnel numbers times the appropriate column of death factors. Second, retired pay is calculated using the previous year's retired pay amounts and the COLA factor. Health care costs are computed similarly, however, the new personnel numbers are used and the health care cost is increased by COMA. The year 2 total cost is computed identically to the procedure described before. This recursive procedure is repeated until twenty years of costs have been calculated.

The last area of the spreadsheet calculates present worth values for individual members. This area uses a Quattro Pro function called Net Present Value (NPV). NPV takes a stream of numbers and calculates a present worth for these numbers. In this and all future spreadsheets, NPV will calculate present worth in 1992 dollars. Appendix A has the Quattro Pro description of the NPV function. All payments are assumed to occur at the end of the year requiring Type 0 to be used in the NPV function throughout.

3.5 YEARS Spreadsheet

The total cost values from the GROUP spreadsheets, are needed by layer 2a or the spreadsheet set, Years. This set has only one spreadsheet and its purpose is to take the total cost values and convert them to present worth 1992 dollars. Figures 3.8 and 3.9 show the block diagram and the calculations used in YEARS. The sets of total cost values are retrieved from GROUP1 though GROUP20. These values are then converted to present worth using the NPV function. A discount rate of 7.5% was used in accordance with the Actuary data (8:D3). The present worths were then summed to get an overall cost of the current system. This overall cost is used by INT1. It is important to note that Block D in the Years spreadsheet is the total cost of the people selecting the current system. Therefore, if everyone selects the current system, the outcome is the cost of the present MRS.

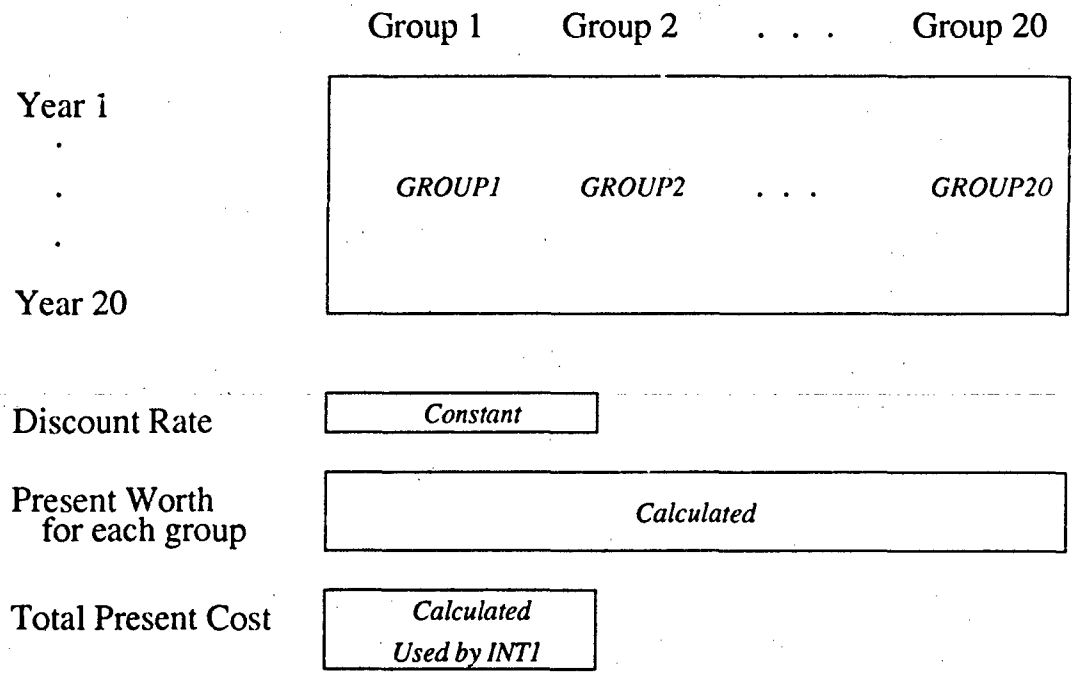


Figure 3.8. YEARS Spreadsheet Layout

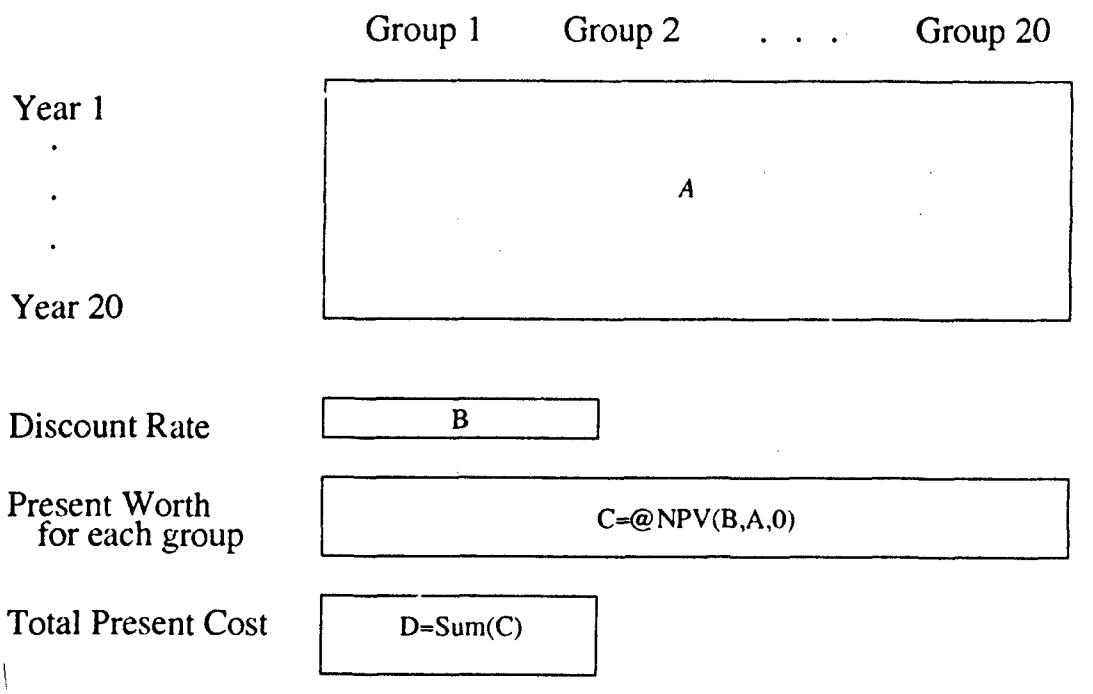


Figure 3.9. YEARS Spreadsheet Calculations

3.6 *PAY Spreadsheets*

The next step in the process was to model the proposed system. This new system had three options in addition to the current system: a pay lump sum, a medical lump sum or both lump sums. Therefore, a model was needed to calculate the costs of each option and merge the costs at the end. The first option modelled was number two, the pay lump sum.

Figures 3.10, 3.12 and 3.14 show the block diagram of the PAY spreadsheet set. Figures 3.11, 3.13 and 3.15 show the calculations. This set has twenty spreadsheets. Each spreadsheet corresponds to the same group of retirees as in the GROUP spreadsheets. The PAY spreadsheet set first calculates the total pay a retiree would receive over twenty years. This value is then decreased by the lump sum percentage to get the lump sum portion of option 2. In addition, the medical annuity costs must be calculated and added to the lump sum value to get the total value (cost) of this option to the retiree (government). However, no mortality rates are used in this spreadsheet set. Since all retirees would receive the lump sum payment, all retirees were also assumed to stay in the system for twenty years. This assumption will overestimate the actual costs for option 2. These spreadsheets start out with a different looking format from GROUP but much of it is identical. In fact, all of Figure 3.10 and the corresponding calculation figure, Figure 3.11, is calculated using the techniques discussed in section 3.4. This includes the COLA adjustment at age 62. However, no health care costs are included in the calculations yet. These total pay values are calculated for twenty years and put into columns for use by Quattro Pro. The discount rate is a constant and equals 7.5%; present worth is calculated using the NPV function. All of this was similar to GROUP. This is where the PAY spreadsheet diverges.

PAY has calculated a lump sum present worth value of a sum of future payments. In other words, if the calculated lump sum value was put in a bank at 7.5% interest for twenty years, the result would be the sum of the individual payments.

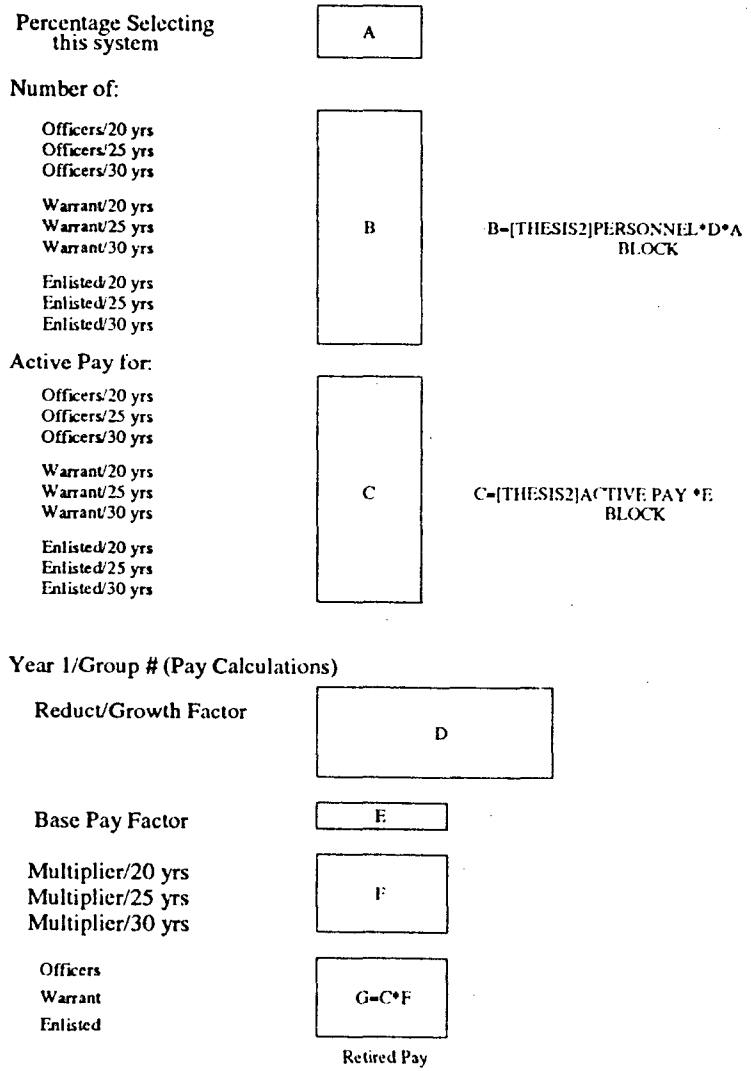


Figure 3.11. PAY Spreadsheet Calculations: Part 1

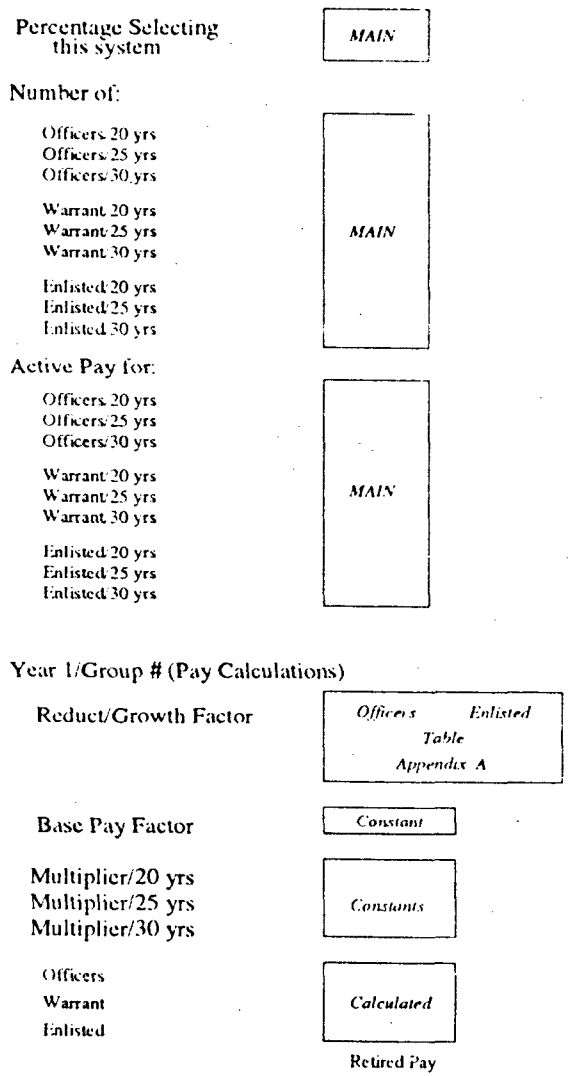


Figure 3.10. PAY Spreadsheet Layout: Part 1

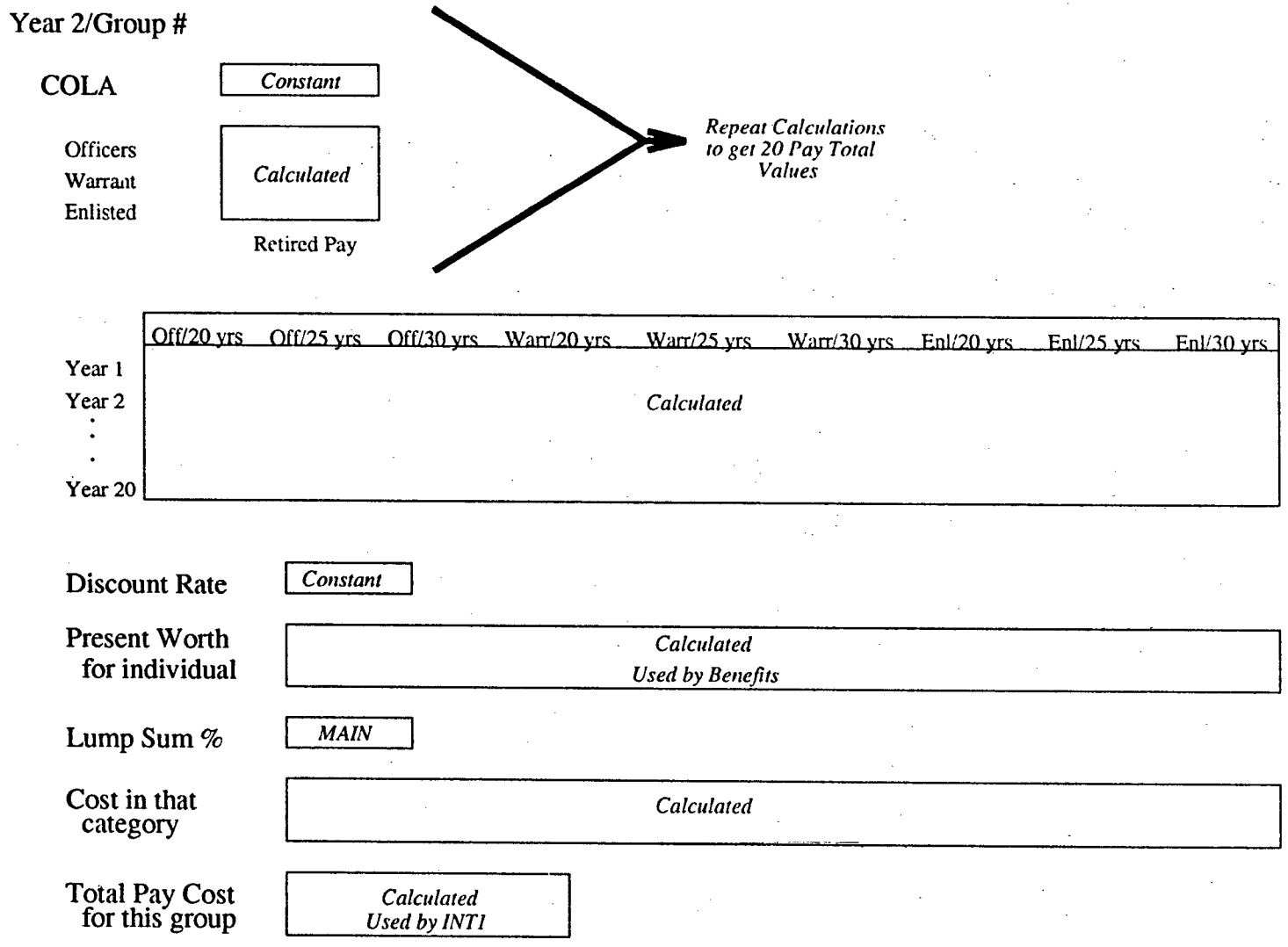


Figure 3.12. PAY Spreadsheet Layout: Part 2

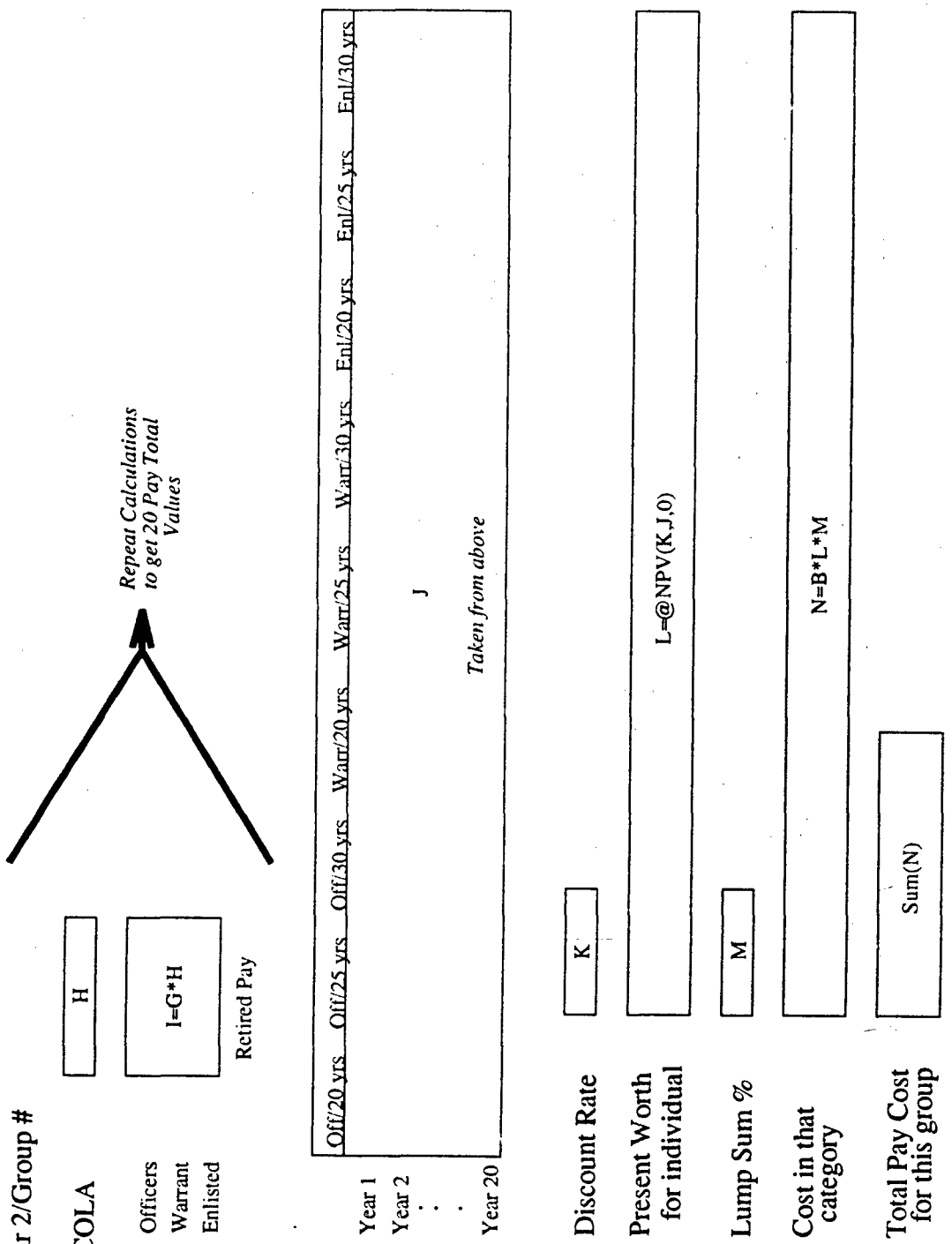


Figure 3.13. PAY Spreadsheet Calculations: Part 2

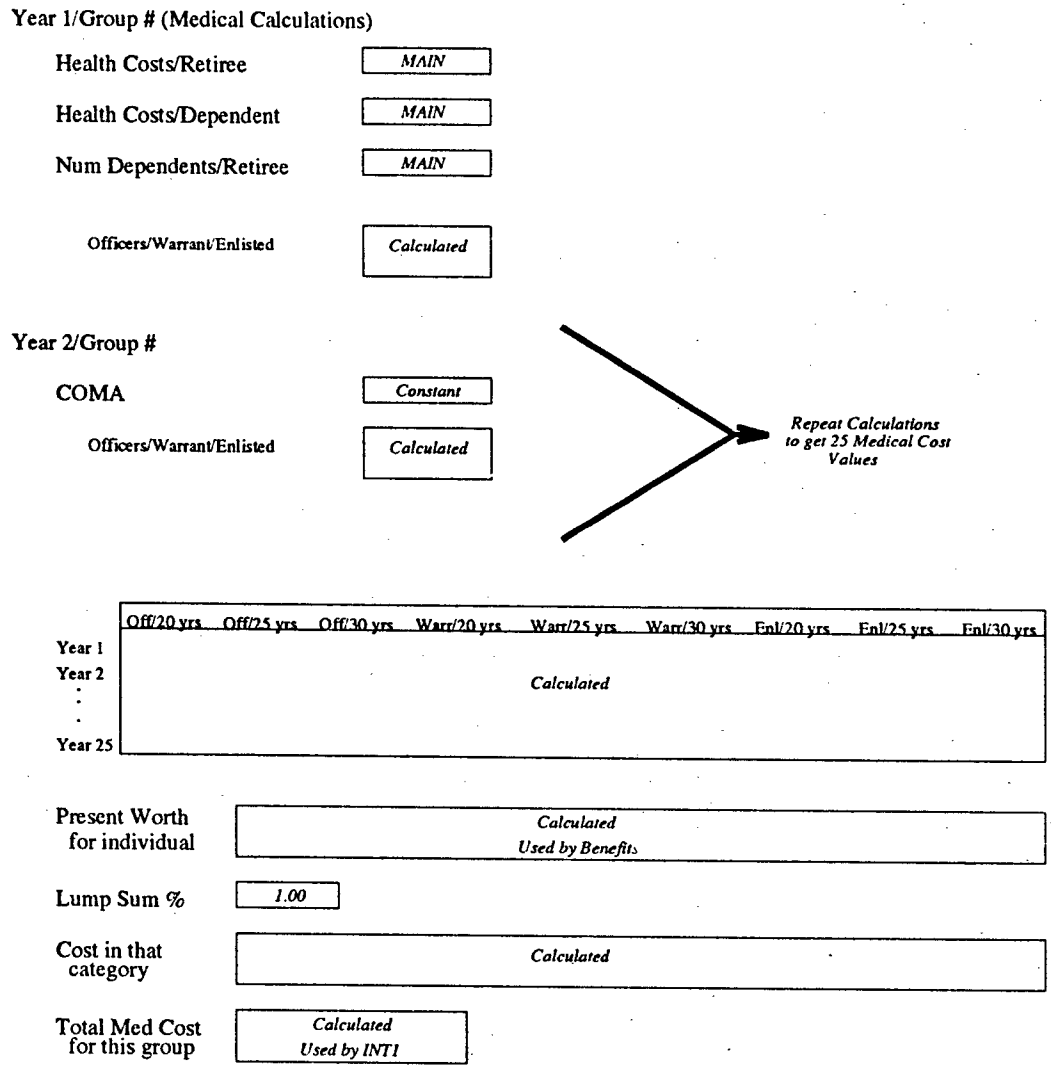


Figure 3.14. PAY Spreadsheet Layout: Part 3

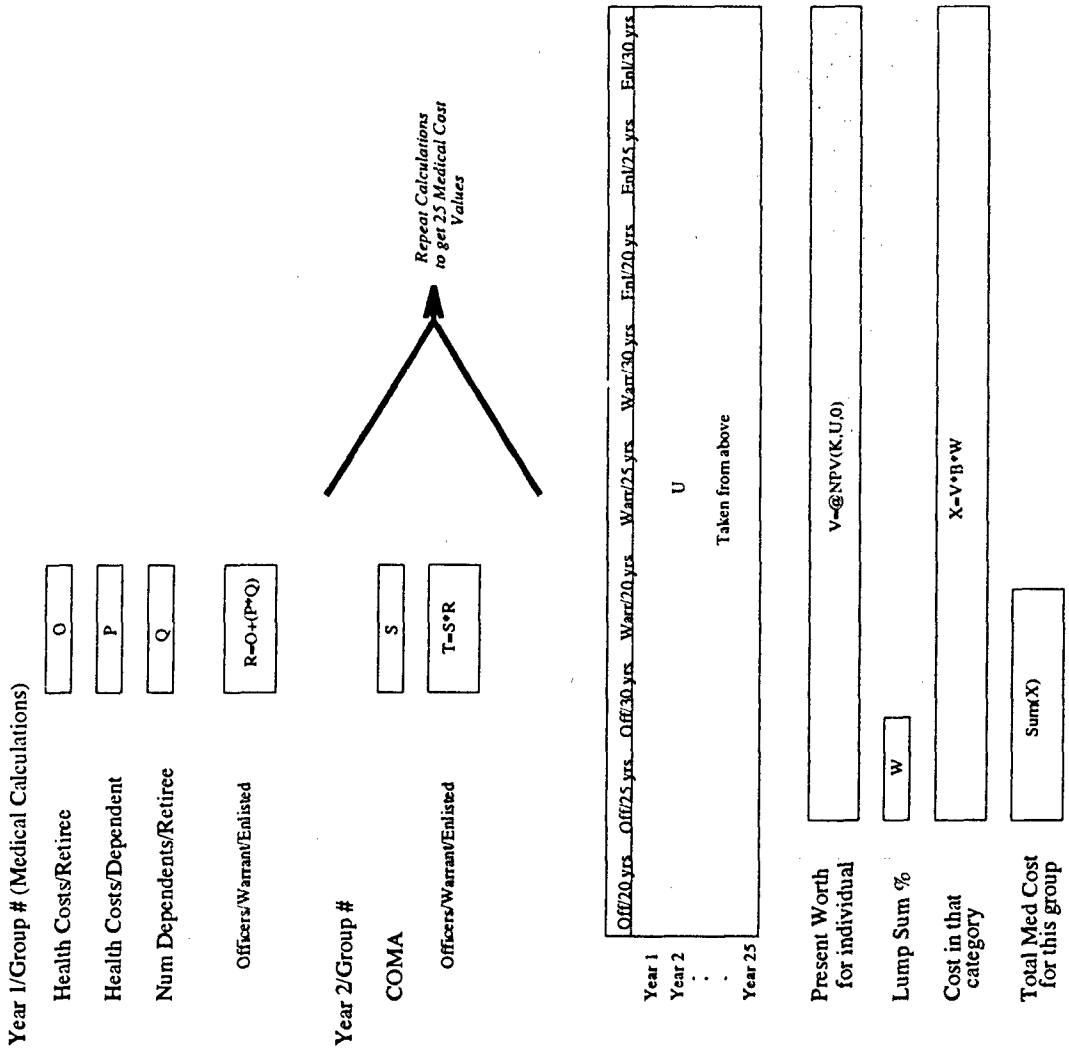


Figure 3.15. PAY Spreadsheet Calculations: Part 3

Thus, this lump sum value is equivalent to receiving each individual payment over time and depositing that payment at 7.5%.

The proposed system has several changeable variables to do sensitivity analysis. One of these variables is the lump sum percentage an individual would receive. A 100% (1.00) of the lump sum amount would be equivalent to receiving the full benefit. A smaller percentage reduces the effective benefit amount. This variable is shown in Figure 3.12 under the title Lump Sum %. It gets its value from MAIN so sensitivity analysis is easier. This value is used to calculate the cost for each category (ranking group) which in turn calculates the total pay cost for this group. The lump sum percentage value is a variable and is selected as discussed in section 3.14.

Cost for each ranking group is calculated as shown in Figure 3.13. This cost equals the number of people selecting this option times the full present worth cost per person times the lump sum percentage. The total *pay* cost is then nothing but the sums of the costs in each category. Note that this is not the *total cost* of this option because it excludes medical costs. Figures 3.14 and 3.15 show the continuation of the PAY spreadsheet.

The medical costs are calculated on an individual basis just like pay was above. However, it is assumed officers, warrant officers and enlisted members receive identical care, thus, they have identical costs. Therefore, they are not broken out individually until later in the spreadsheet. Blocks O, P and Q, in Figure 3.15, are constants retrieved from MAIN. Block R is the cost for one individual and his/her family to use the military health care system for one year. As stated before, this cost rises every year. Thus, year 2's costs are increased by the COMA factor. These medical calculations are repeated for twenty-five years. These costs are repeated for twenty-five years because of age differences among the individuals and CHAMPUS regulations. Someone retiring at twenty years will have longer eligibility than someone retiring at thirty years. Similarly, an enlisted member will be entitled to longer

medical benefits because of a younger retirement age, on average than officers. Table 3.4 shows how many years in general each individual will be eligible for benefits.

Number of Years of Calculated Health Care Benefits						
	Officers and Warrants			Enlisted		
Served	20 years	22.5 years	27.5 years	20 years	22.5 years	27.5 years
Entitled	22	20	15	25	23	18

Table 3.4. Years of Medical Care Eligibility

These numbers were created using two simple facts: the average retirement age of each category and CHAMPUS benefits end at age 65. Thus, an average officer with twenty years service retires at age 43 (5:267). He/she has $65 - 43 = 22$ years of eligibility for medical benefits. The average enlisted person with twenty years service retires at 40 (5:267). He/she has $65 - 40 = 25$ years of eligibility. These calculations were continued to produce Table 3.4. Note that for members retiring between 21-25 and 26+ years, values of 22.5 and 27.5 years respectively, where used in the calculations.

Then the calculations are computed for twenty-five years and the appropriate number of payments is transferred to box U. At this time, an important assumption should be restated. All medical benefits were lost to the retiree *and* his/her family when the retiree turned 65. This is the same assumption used in the Group spreadsheet set.

Finally, box U is taken and converted to present worth values for each category. The lump sum percentage is 1.00 because the retiree is receiving medical care and not a lump sum amount. Medical costs are calculated exactly as pay costs from here on. Now, the total pay cost value and the total medical cost value can be transferred to INT1.

3.7 MED Spreadsheets

In this option, the retiree selects a lump sum payment in-place of their medical benefit and receives a pay annuity. Since the two options are so closely related, the MED spreadsheet set is almost identical to the PAY spreadsheet set. The MED spreadsheet set also has twenty spreadsheets corresponding to the same groups as PAY and GROUP. Figures 3.16 through 3.21 show the block diagram and calculations of these spreadsheets. This spreadsheet set also neglects the mortality of retirees, resulting in an overestimate of actual costs. The only discussion will be on the differences between the PAY and MED spreadsheets. These differences are circled for quick identification.

As the reader can discern, Figures 3.16 and 3.17 show no differences. The top portion of the spreadsheet still calculates the pay costs. Thus, the change shown in Figure 3.18. Now, the pay is an annuity and not a lump sum so the 1.00 replaces the percentage value. Figure 3.20 shows a second similar change. The medical costs are lump sum amount so a percentage must be used. All other calculations are the same as in PAY.

3.8 BOTH Spreadsheets

The final option allows a retiree to take a lump sum for both pay and medical benefits. These spreadsheets are very similar to the PAY and MED spreadsheet sets. The BOTH spreadsheet set has twenty spreadsheets corresponding to the same groups as all the other layer 2 spreadsheets. Figures 3.22 through 3.29 show the block diagrams and calculations of these spreadsheets. This spreadsheet set does not include the mortality of retirees because it is not relevant. Since everyone choosing this option gets only a lump sum amount and not an annuity, it does not matter if the retiree succumbs after being "bought out" of the system. The cost values are not affected. Once again, the differences are circled. In this case, both the lump sum factors need to be percentages. All other calculations are identical with the

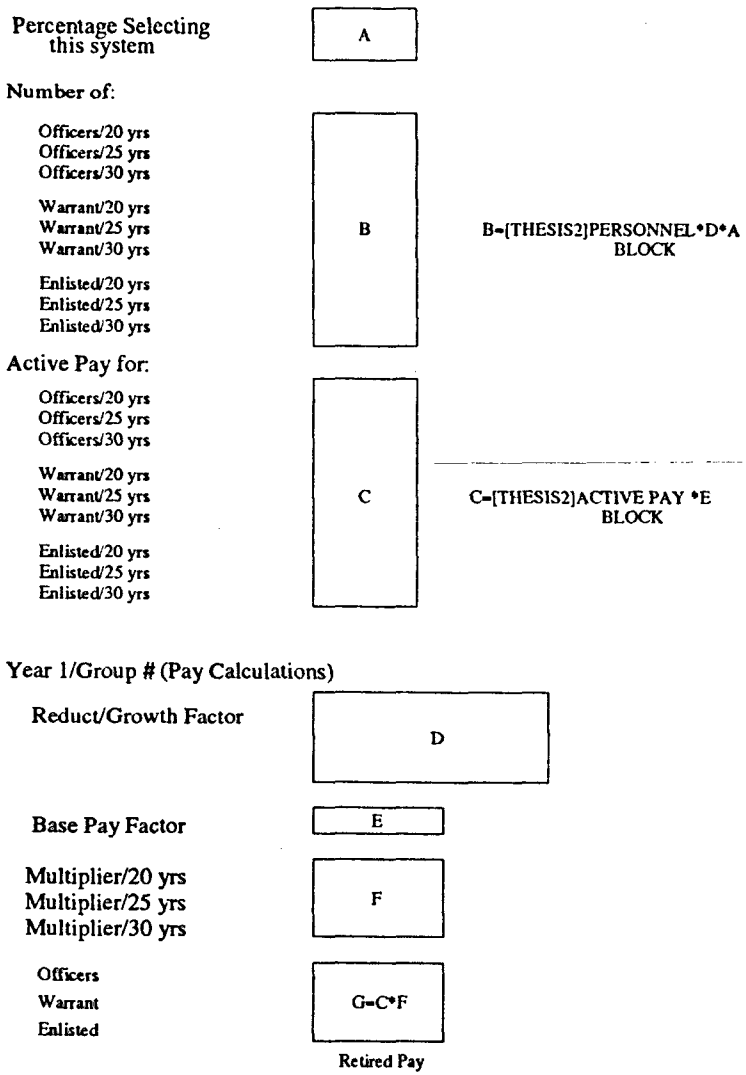


Figure 3.17. MED Spreadsheet Calculations: Part 1

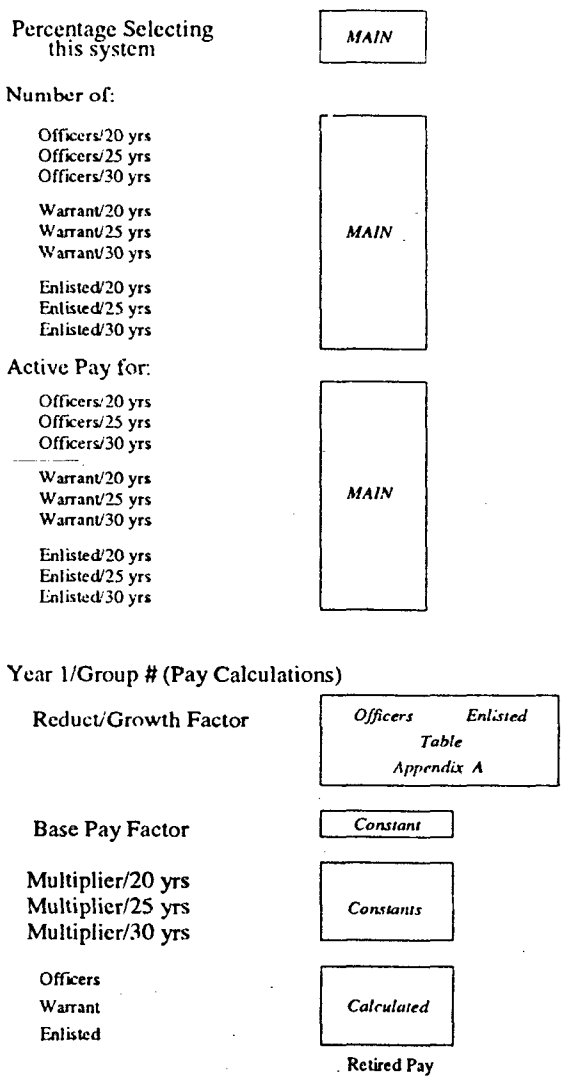


Figure 3.16. MED Spreadsheet Layout: Part 1

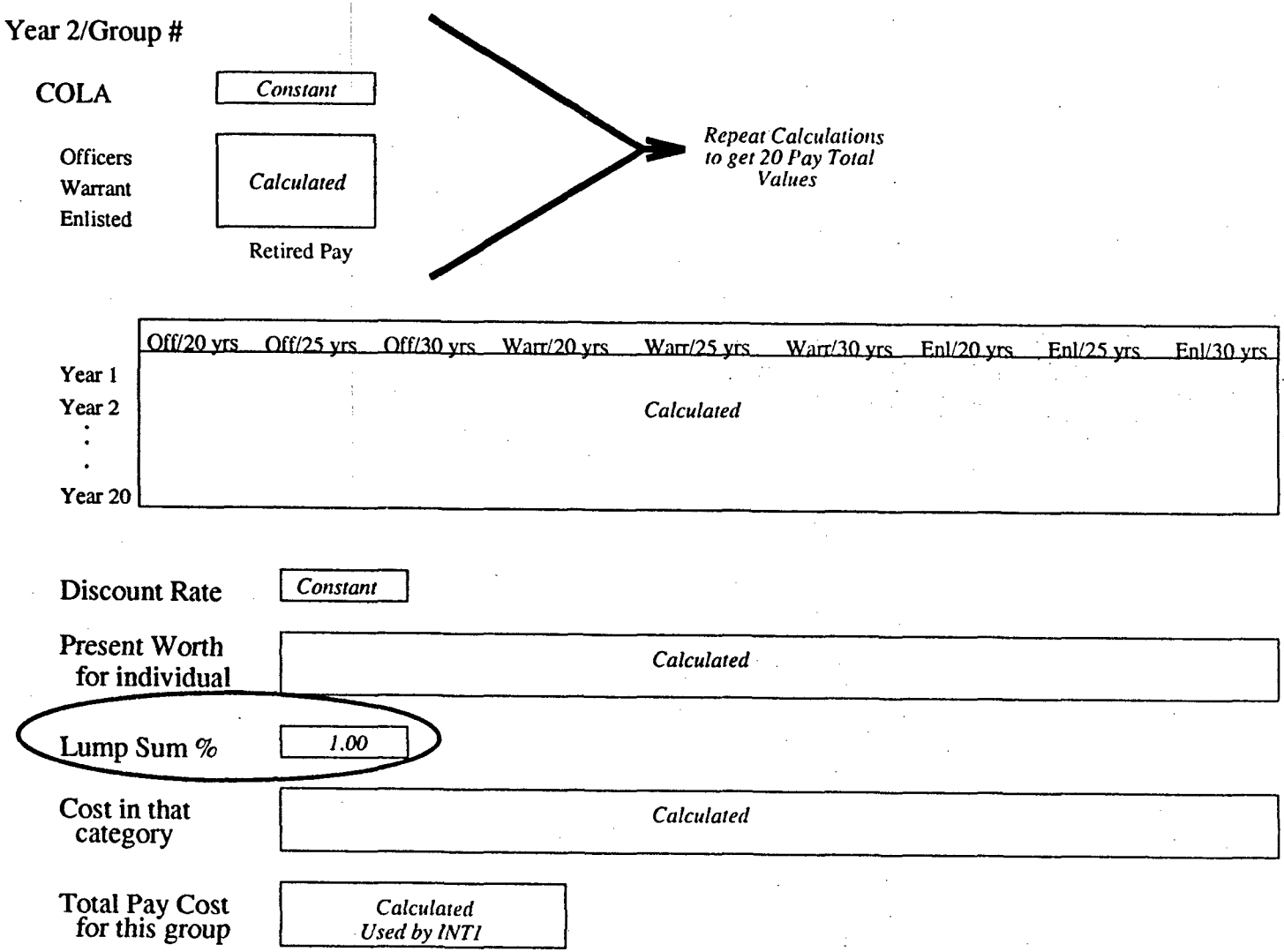


Figure 3.18. MED Spreadsheet Layout: Part 2

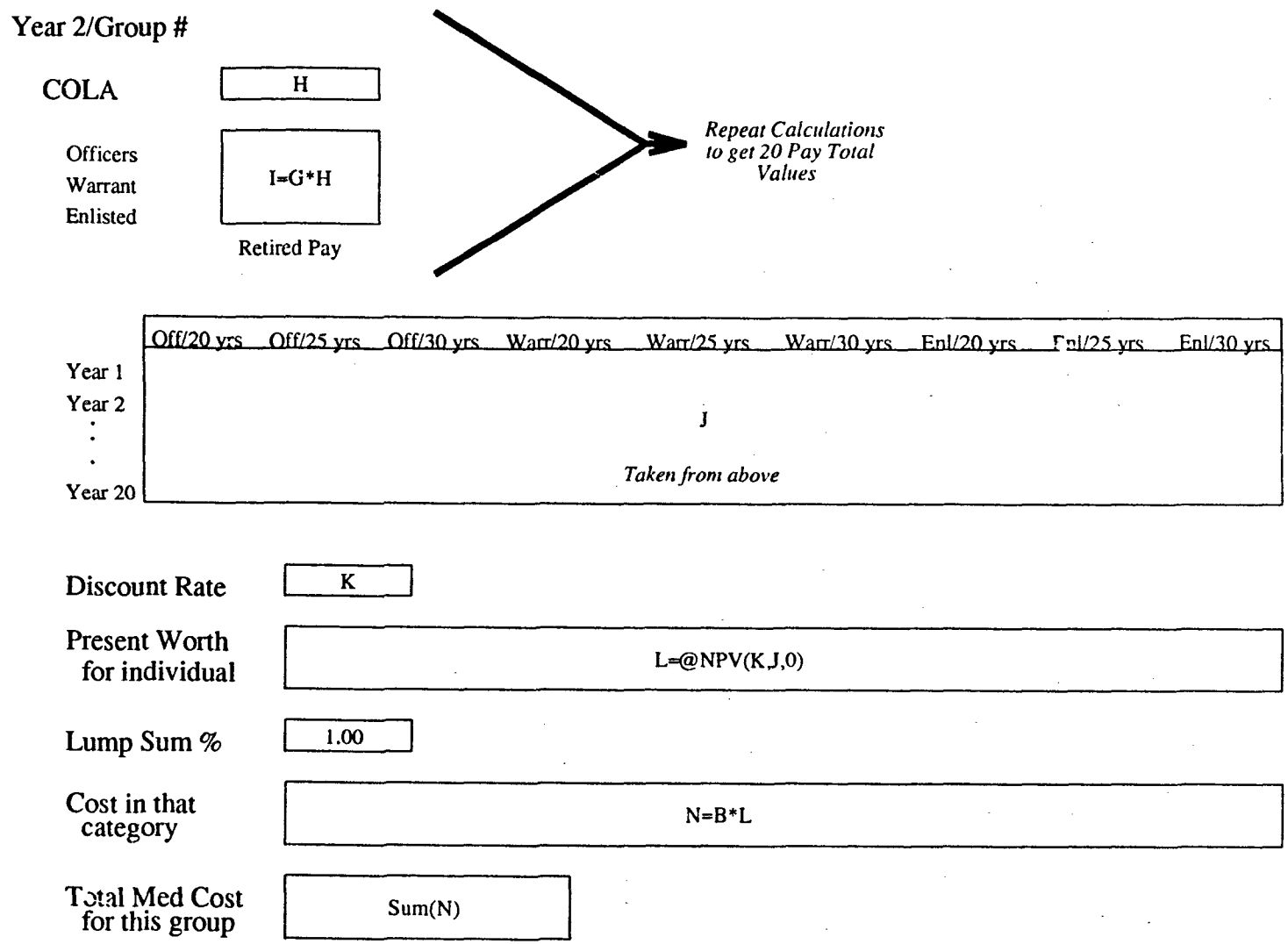


Figure 3.19. MED Spreadsheet Calculations: Part 2

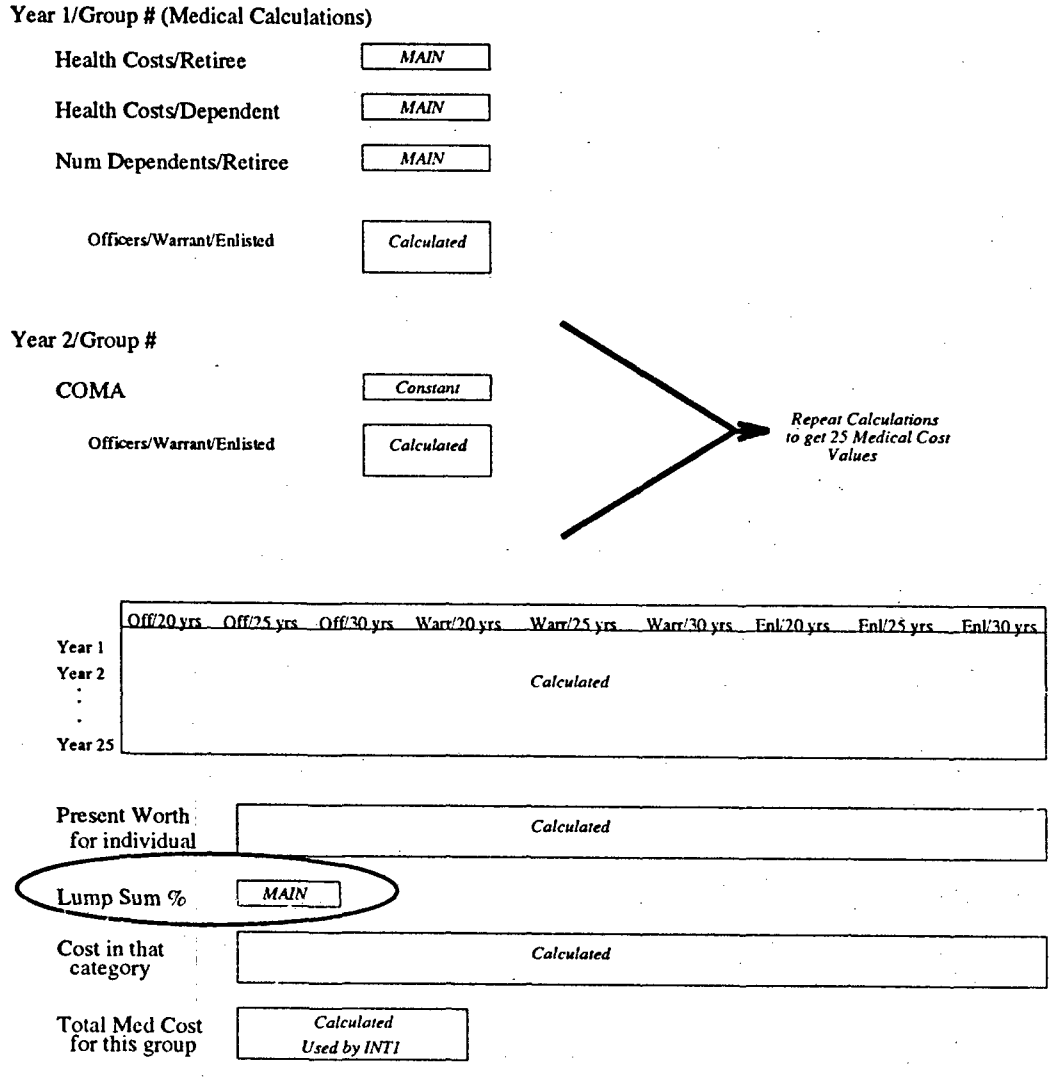


Figure 3.20. MED Spreadsheet Layout: Part 3

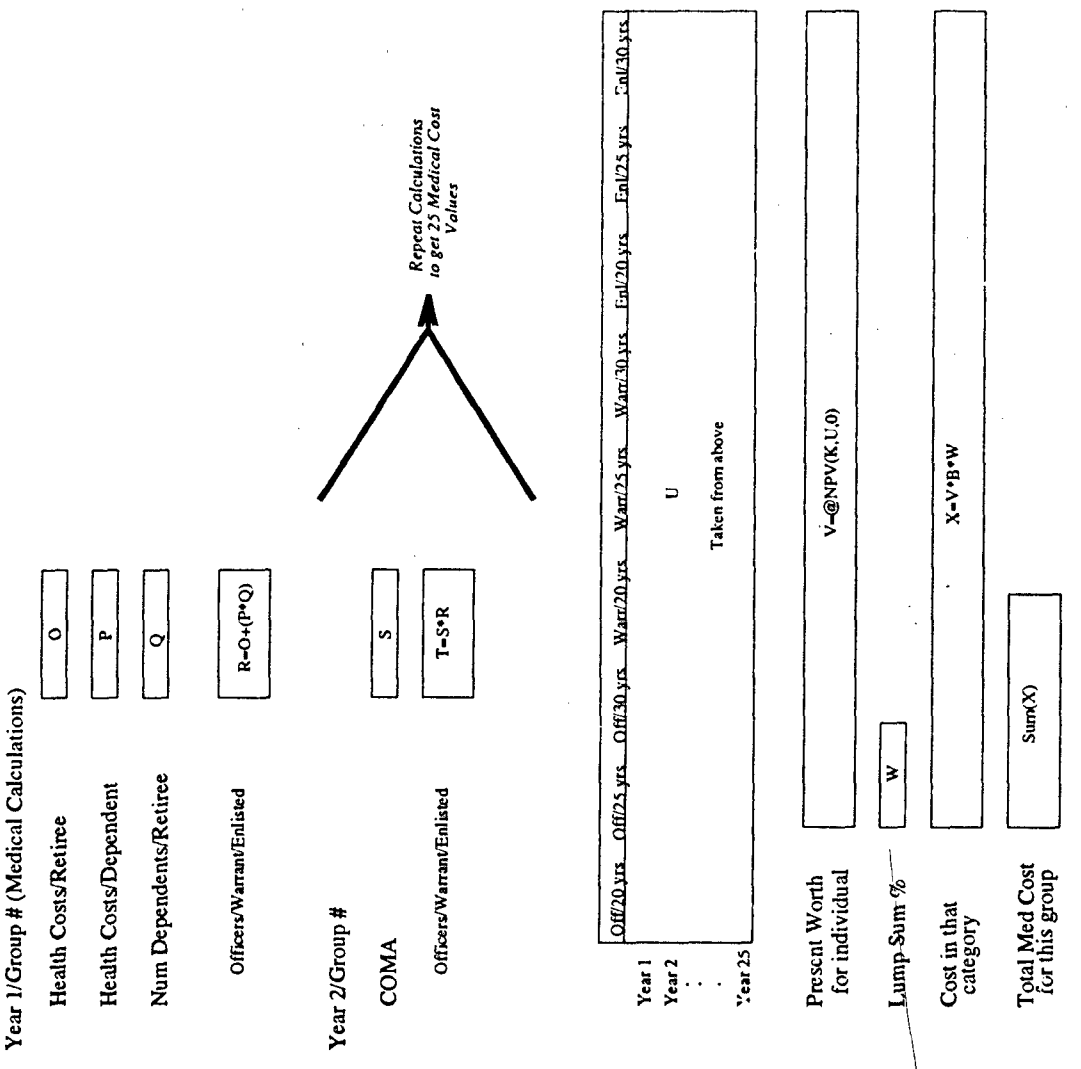


Figure 3.21. MED Spreadsheet Calculations: Part 3

exception of an additional step. The additional step is shown in Figures 3.28 and 3.29. Present worth is calculated by summing the pay and medical costs for each category. Finally, a total cost is calculated and used by INT2.

3.9 INT1 and INT2 Spreadsheets

Layer 3 has only two spreadsheet sets and each set contains one spreadsheet. These spreadsheets are "intermediate" spreadsheets between layer 2 and layer 4. These spreadsheets were developed to get around software limitations. Quattro Pro only allows 51 separate spreadsheets (windows) to be referenced by a single spreadsheet. In this case, ALT was trying to reference 61 separate spreadsheets (1 YEARS, 20 PAY, 20 MED and 20 BOTH). Because of this limitation, all the cost data could not be combined into a single spreadsheet as was required at the beginning of the study. Therefore, YEARS, PAY and MED cost data goes to INT1 and BOTH goes to INT2. Then the cost data is brought together in ALT. This works because ALT is referencing only two spreadsheets; INT1 and INT2. It does not matter that INT1 and INT2 reference other spreadsheets. Consequently, INT1 and INT2 are not truly part of the cost model and they perform no calculations. The layout of these spreadsheets is not included because it is not relevant or needed in understanding the model.

3.10 BENEFITS Spreadsheet

Layer four prepares the data for analysis. This layer has two spreadsheet sets. The BENEFITS set contains only one spreadsheet. This spreadsheet's purpose is to gather the benefit dollar amounts. The benefit dollar amounts refer to the amount of money an individual would receive for each option over the twenty year period in 1992 dollars. These dollar amounts were calculated in GROUP and PAY as explained below.

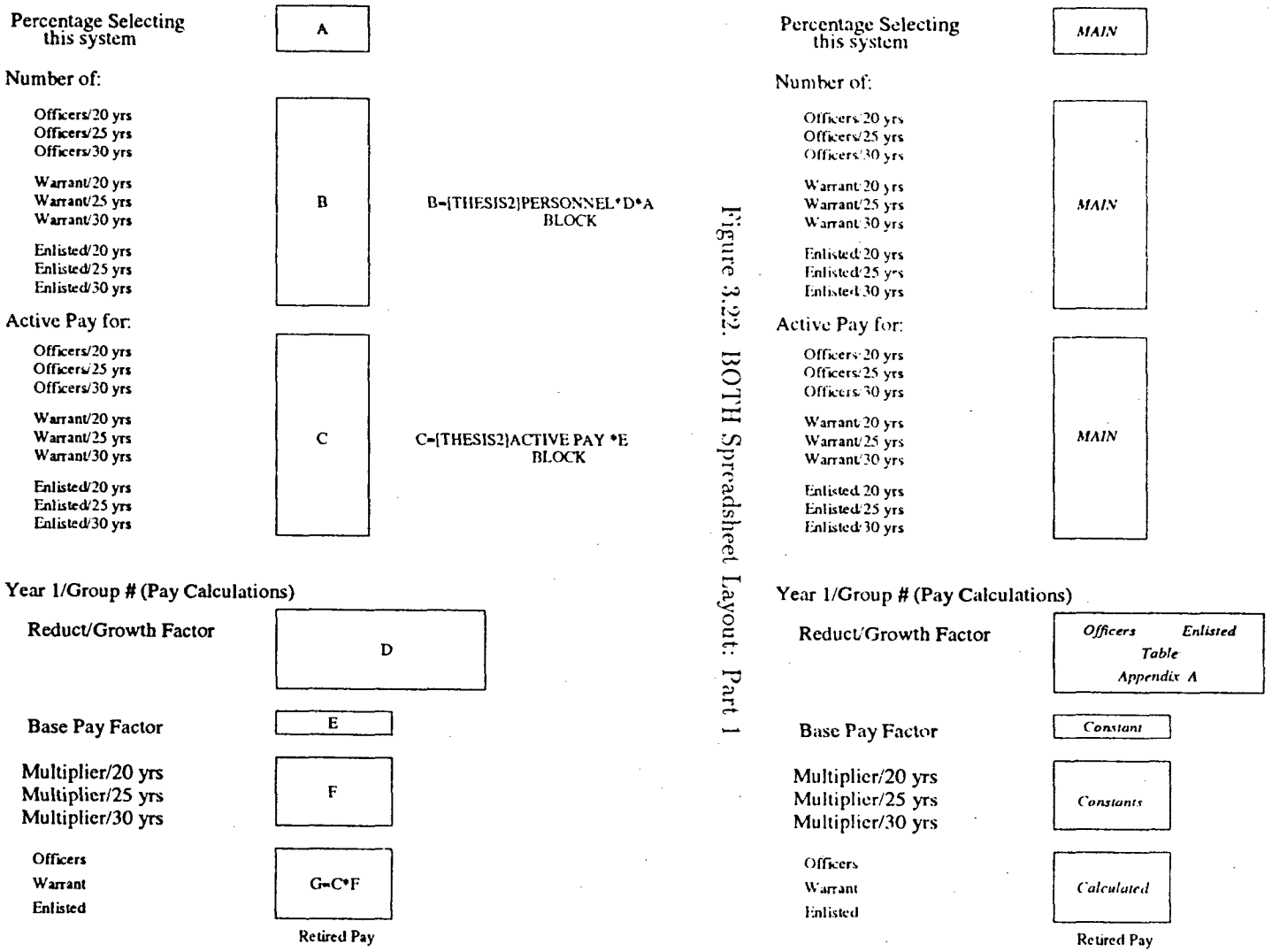


Figure 3.23. BOTH Spreadsheet Calculations: Part 1

Figure 3.22. BOTH Spreadsheet Layout: Part 1

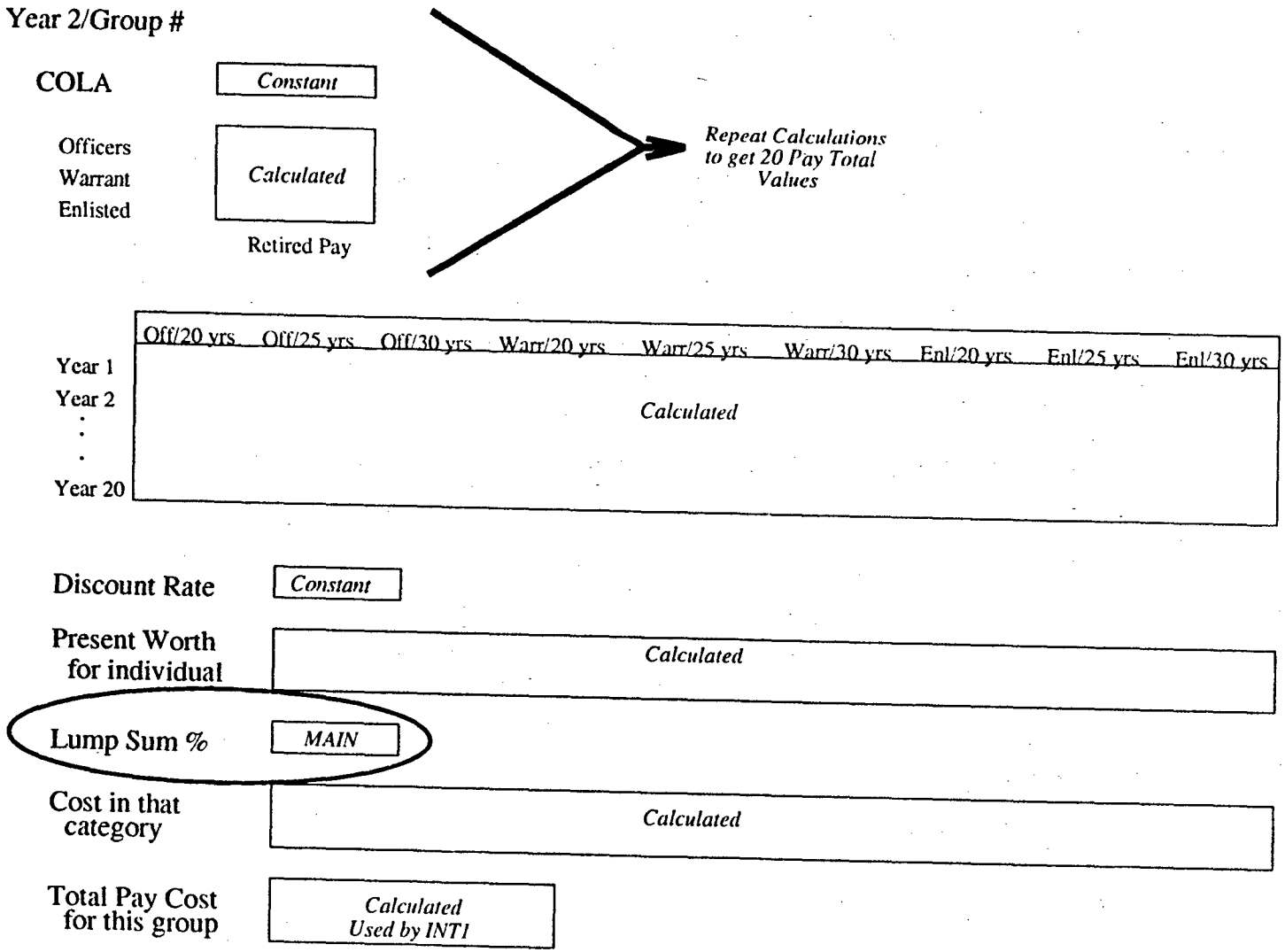


Figure 3.24. BOTH Spreadsheet Layout: Part 2

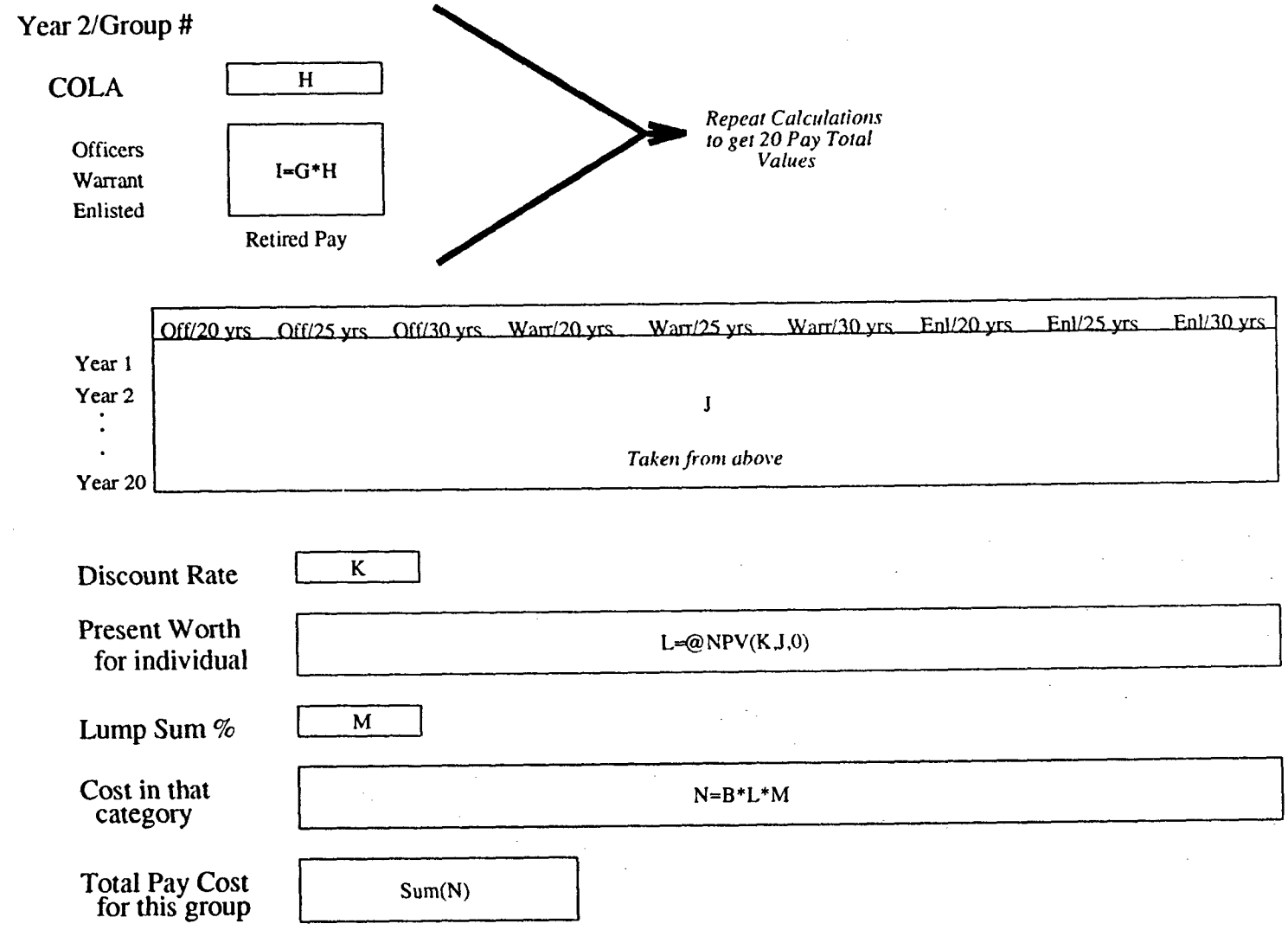


Figure 3.25. BOTH Spreadsheet Calculations: Part 2

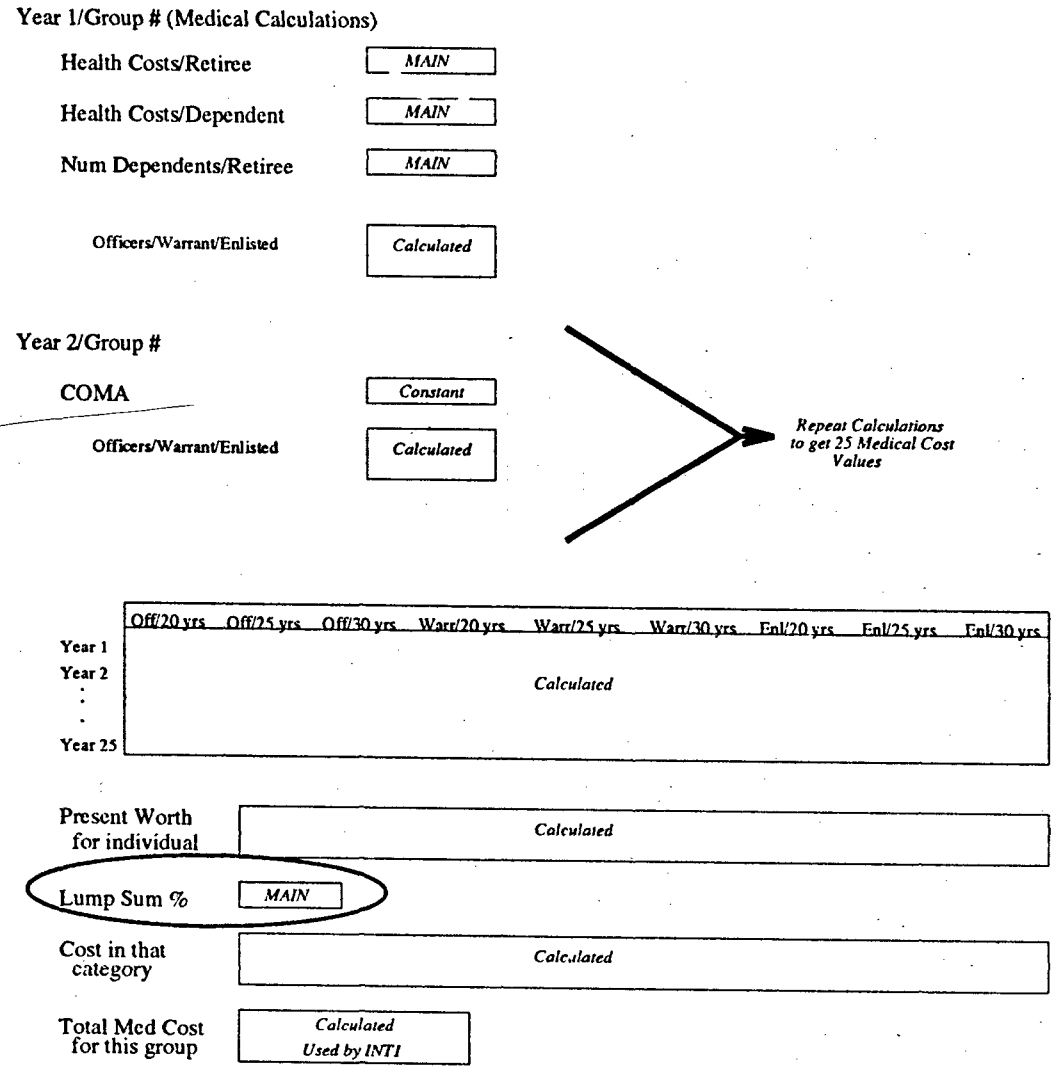


Figure 3.26. BOTH Spreadsheet Layout: Part 3

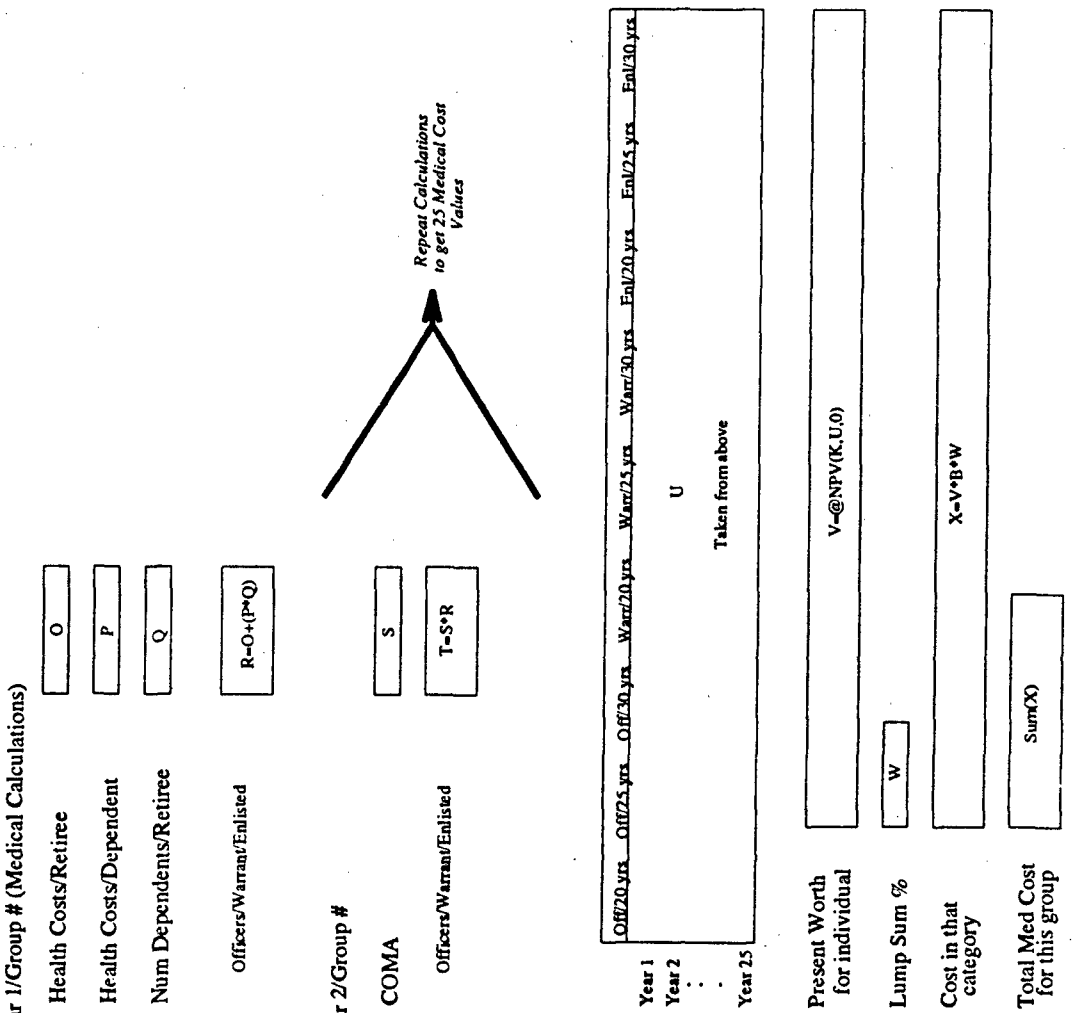


Figure 3.27. BOTH Spreadsheet Calculations: Part 3

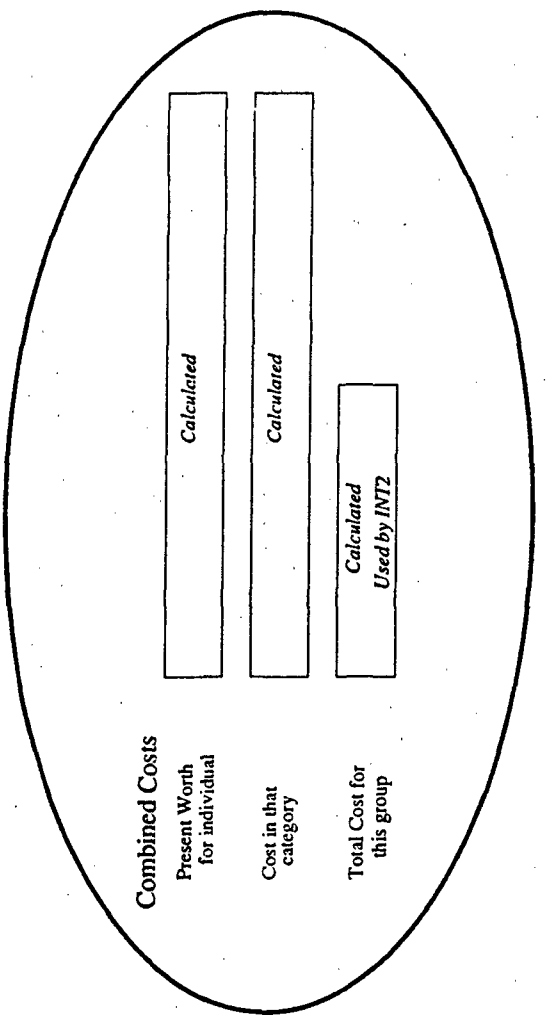


Figure 3.28. BOTH Spreadsheet Layout: Part 4

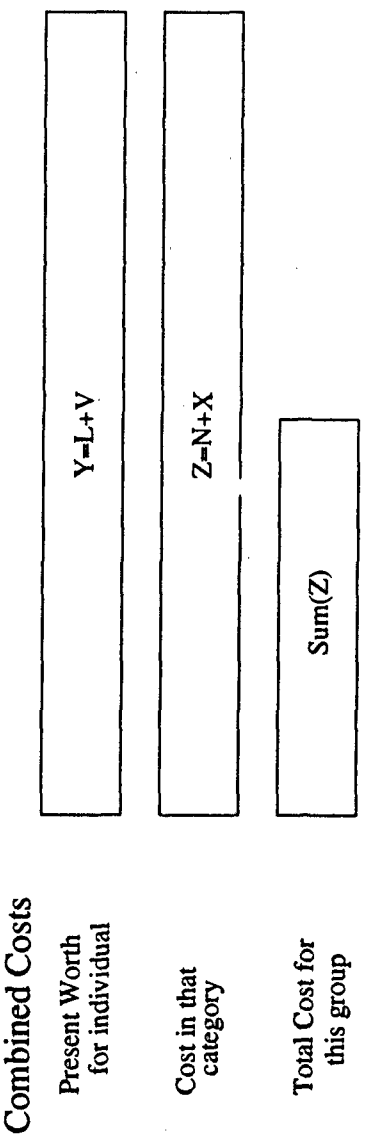


Figure 3.29. BOTH Spreadsheet Calculations: Part 4

Figures 3.30 and 3.31 show the block diagram and calculations of the spreadsheet.

The current system 100% (1.00) benefit dollars are calculated in GROUP and retrieved here. The pay lump sum amounts and annuity amounts are calculated in PAY for the 100% (1.00) benefit level also. The reader, if understanding present worth ideas, should note that all options have equal present worths at the 100% benefit level. Therefore, instead of actually calculating the benefit dollars in every spreadsheet, the PAY spreadsheet numbers were used for the MED and BOTH spreadsheet numbers in BENEFITS. The current system numbers will be calculated individually because the spreadsheet is very different from PAY. However, the results should be equivalent. In other words, since PAY and MED are similar, the MED lump sum amount equals the medical annuity amount at 100% (1.00) benefit. The medical annuity equals the PAY lump sum amount; again *only* at the 100% (1.00) benefit level. In addition, the BOTH lump sum amount equals the PAY lump sum plus the MED lump sum at 100% (1.00) benefit. These numbers are now the basis for further calculations.

The current system benefit dollars always remain constant because no lump sum amount is involved. The pay option includes only a reduction to the PAY lump sum but not to the medical annuity. Thus, the PAY lump sum amount is multiplied by the lump sum percentage but the annuity is not (Blocks D,E,F versus C). The total benefit dollars for this option is just the sum of the proper columns. The calculations for MED and BOTH are similar (see Figure 3.31 for actual calculations). Note that PAY, MED and BOTH have identical total benefit dollars only at the 100% (1.00) lump sum amount.

3.11 ALT Spreadsheets

The second set of spreadsheets in layer 4 is ALT. This spreadsheet set has a variable number of spreadsheets. Each time an alternative is run, a new spreadsheet

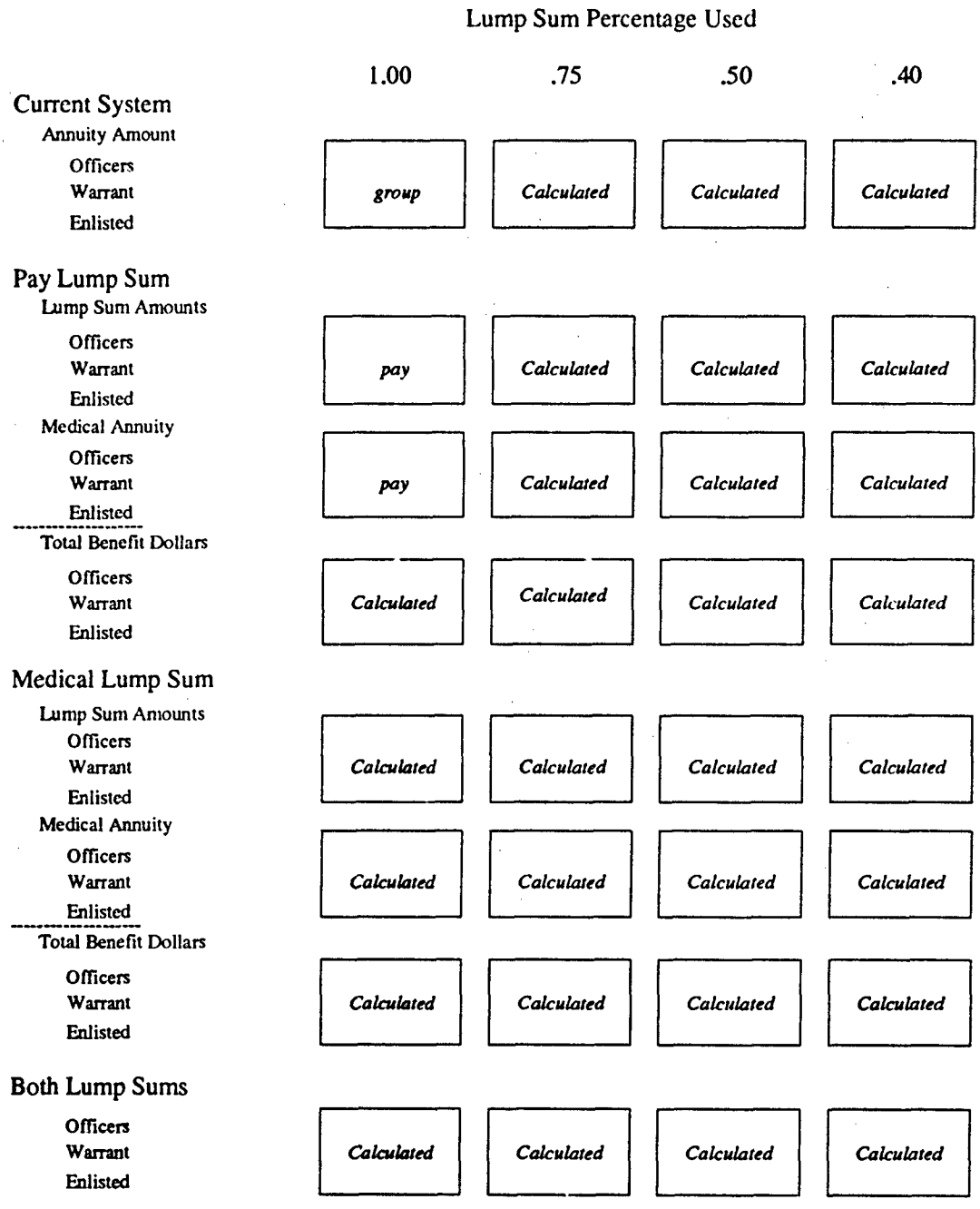


Figure 3.30. BENEFITS Spreadsheet Layout

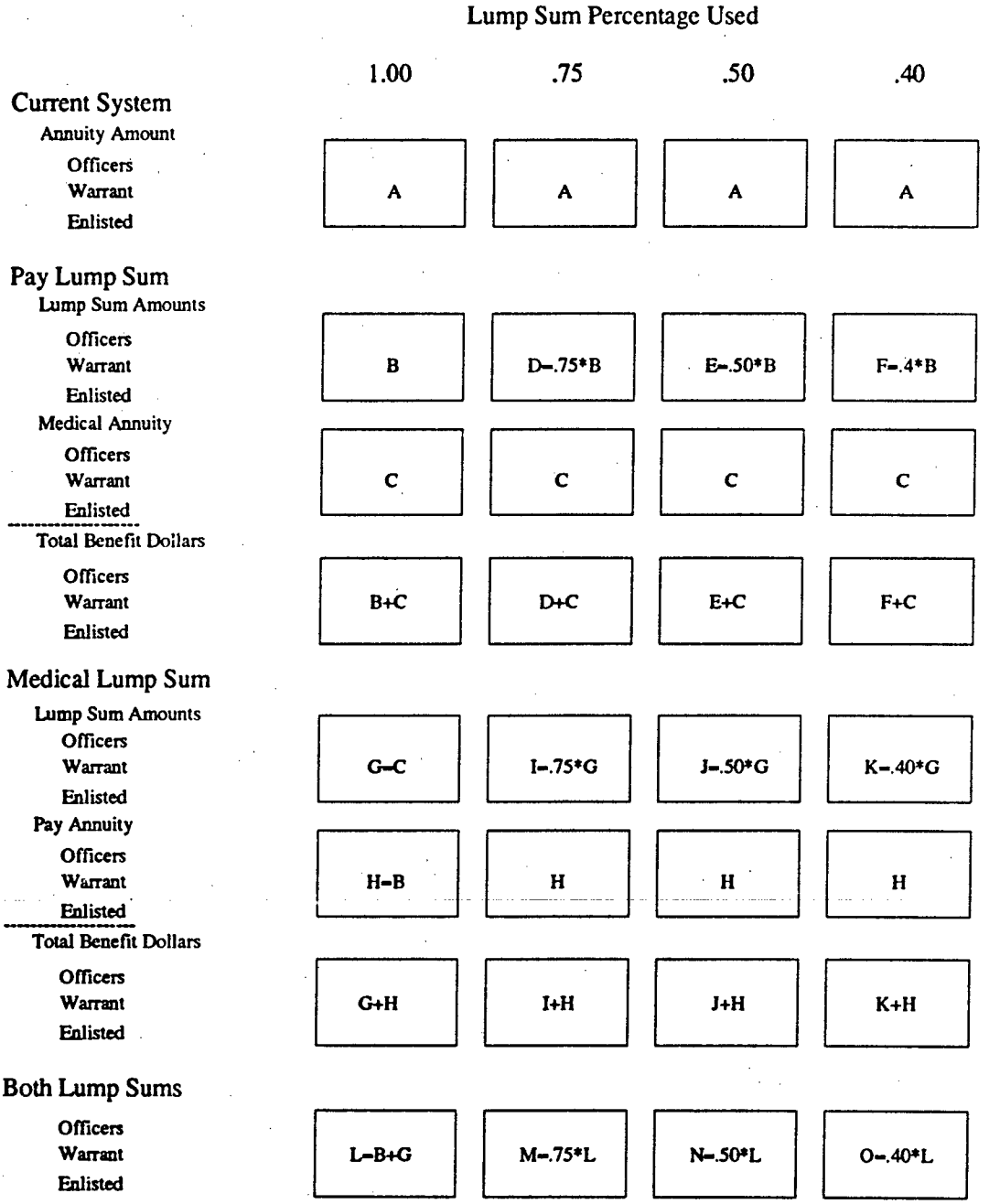


Figure 3.31. BENEFITS Spreadsheet Calculations

is created. An alternative is created by changing the percentage of people choosing each option, the lump sum percentage or any other constant contained within MAIN. Thus, ALT displays the results of the sensitivity analysis. This will be discussed in greater detail in section 3.14.

The block diagram and calculations for ALT are shown in Figures 3.32 and 3.33.

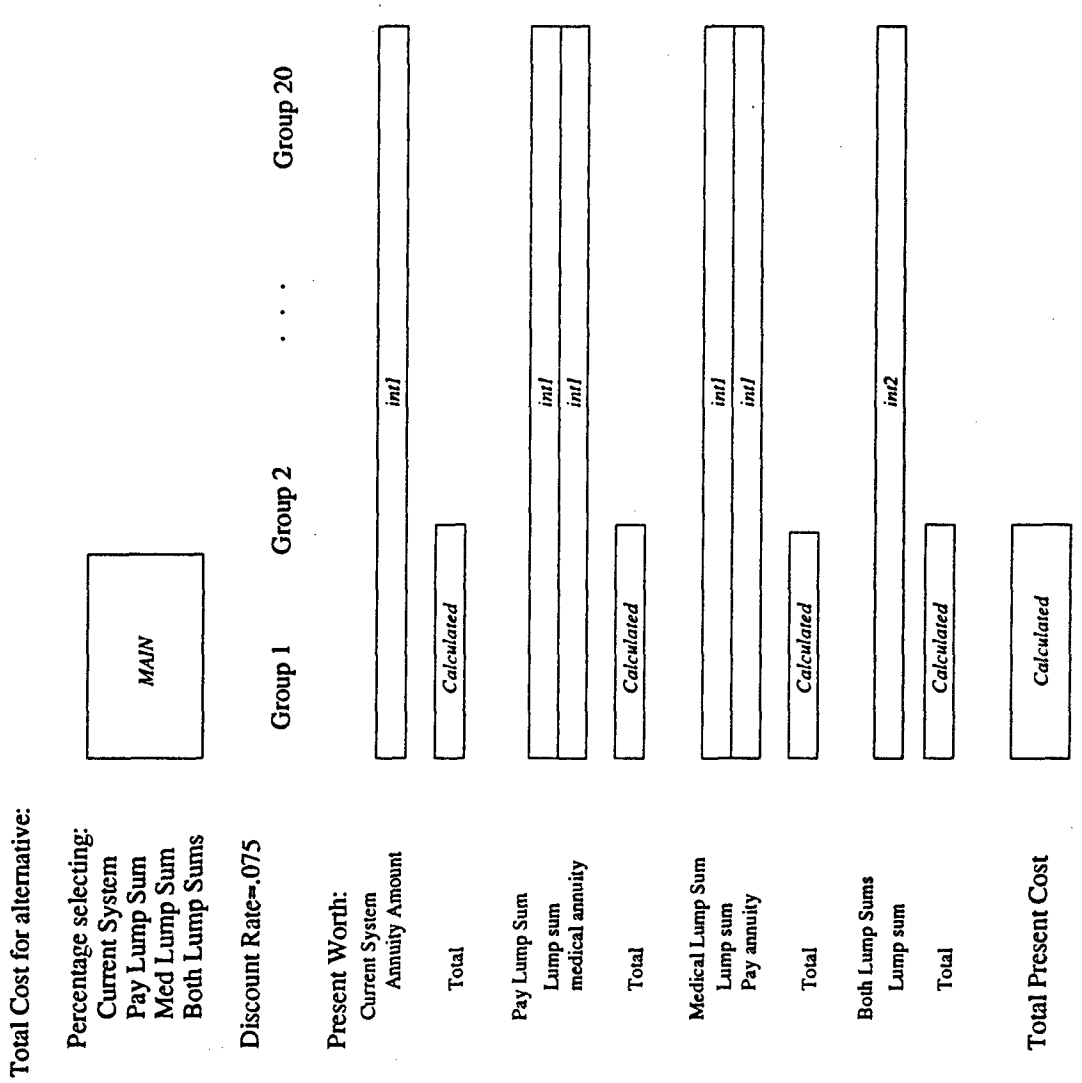


Figure 3.32. ALT Spreadsheet Layout

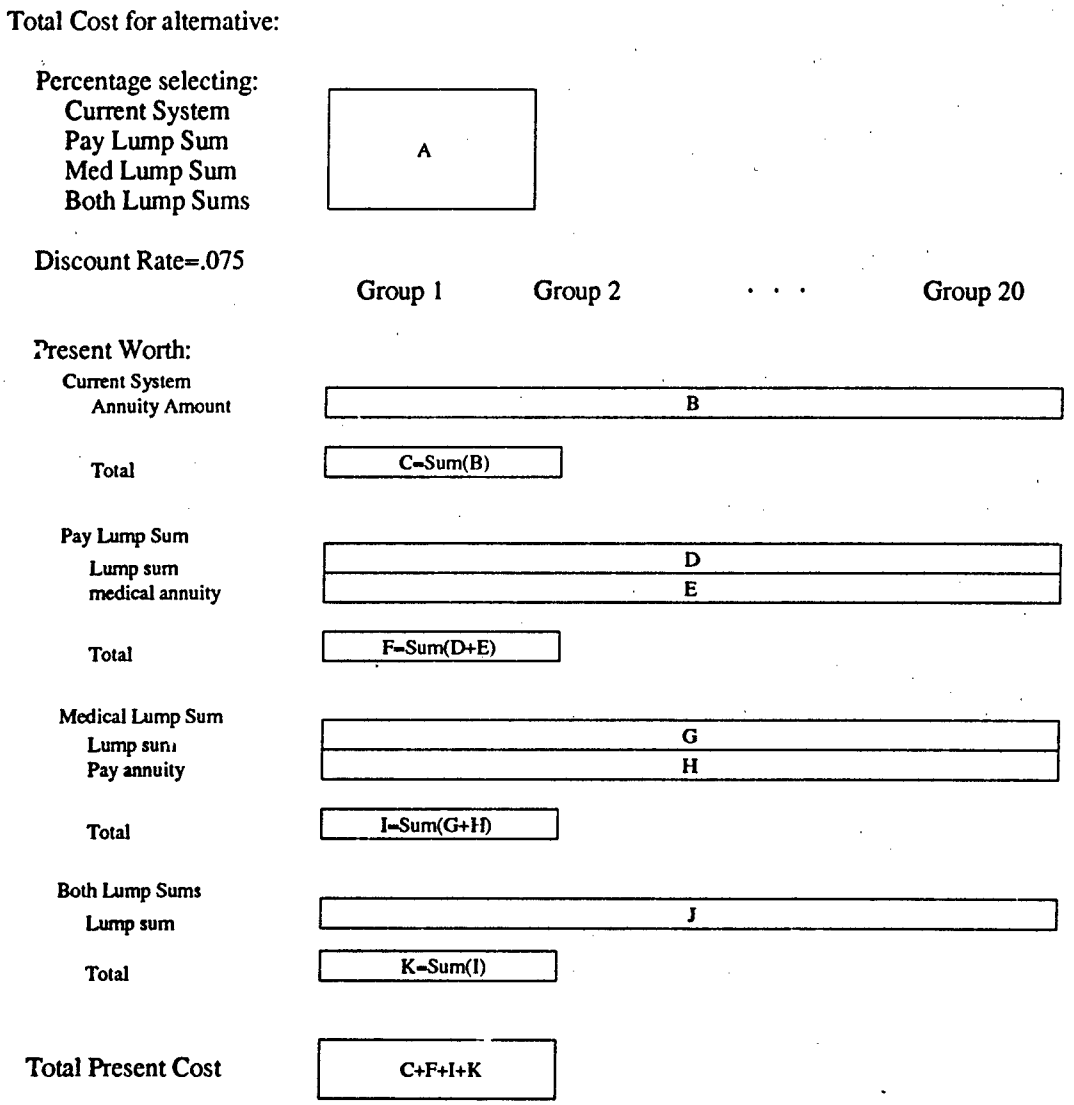


Figure 3.33. ALT Spreadsheet Calculations

Block A is taken from thesis2 and only used to save the values used in this alternative. These percentages do not perform any calculations in the ALT spreadsheet. In fact, ALT's main task is to compile the cost data which is actually calculated in YEARS, PAY, MED, and BOTH. In addition, ALT saves the results of each run for comparison purposes later. The way in which this data is saved is discussed in section 3.13. However, it should be stated here that ALT is actually a form that is filled in and saved after every run. ALT gets its data from INT1 and INT2 for the reasons discussed in section 3.9. ALT takes the individual group cost data and calculates an overall or grand total cost for a particular alternative. This grand total is then sent to layer 5 for analysis.

3.12 ANALYSIS

The final layer, layer 5, produces the sensitivity analysis and the corresponding graphs. This spreadsheet set contains one spreadsheet. This spreadsheet is arranged so information can be graphed by Quattro Pro. No calculations are performed. Therefore, since the data is retrieved from BENEFITS and ALT, an analysis spreadsheet layout is not included. The layout and this spreadsheet are only needed to compare the data graphically. This spreadsheet is similar to INT1 and INT2 in that it is not actually part of the model. Its main purpose is to combine BENEFITS and ALT and display these results graphically. Examples of ANALYSIS output can be seen in Chapter 4.

3.13 Employing the Model

The ten spreadsheet sets shown in Figure 3.1 create one alternative. Each time the constants in MAIN are changed, a new run must be done; which creates a new ALT. However, because of the way the model is set up, the old ALT spreadsheet gets destroyed. To prevent the loss of this data, another Quattro Pro function was used. The values function in Quattro Pro takes a spreadsheet cell(s) and stores

its actual value without any references attached to it. This command was used to create a new spreadsheet from the ALT spreadsheet form. In other words, ALT1 saved the actual values contained in the cells created in the run without saving the references to INT1 or INT2. This new spreadsheet contains only values and it will not change when a new run is done. This new spreadsheet is the one that passes data to ANALYSIS. The values command must be called after every run to create the new ALT spreadsheet.

The running of this model was fairly simple. The variables were changed in MAIN and then a macro was invoked to update the 84 spreadsheets. This updating required each spreadsheet to be opened, updated (looking to its referenced spreadsheets), saved and then closed. This process took approximately fifteen minutes per run. Finally, the values command was called saving that alternative. After all this was accomplished, the model was ready for another run.

3.14 Sensitivity

The main objective of this research was to provide a less expensive military retirement system using a new benefit structure. A new structure was proposed so sensitivity analysis needed to be completed on the new system. The independent variables in this case are:

- Percentages selecting each option
- Lump Sum percentages
- Discount Factor
- Miscellaneous Factors
  - Actual Health Care Costs
  - COLA values
  - COMA values

– Number of Dependents per Retiree

The Percentages selecting each option and Lump Sum percentages were changed while all other variables were kept as constants. The idea behind this plan of attack was to see how the number of people selecting each option changed the overall cost. As stated in Chapter 1, these percentages were not quantified using data collected from actual DoD personnel. However, realistic values were chosen using acquired knowledge and VSI/SSB plans as a guideline for the percentages. Tables 3.5 and 3.6 show the test matrices used for sensitivity analysis.

Test Matrix 1				
Block	Option	Lump Sum Percentage 1	Lump Sum Percentage 2	Lump Sum Percentage 3
1	1	1.00	1.00	1.00
	2	.00	.00	.00
	3	.00	.00	.00
	4	.00	.00	.00
2	1	.750	.750	.750
	2	.084	.084	.084
	3	.083	.083	.083
	4	.083	.083	.083
3	1	.500	.500	.500
	2	.167	.167	.167
	3	.167	.167	.167
	4	.166	.166	.166

Table 3.5. Test Matrix: Part 1

Table 3.5 tests the sensitivity of different lump sum percentage against total costs (across the matrix) and tests sensitivity of costs on the percentage selecting option1 versus all other options equally (down the matrix). Lump Sum percentage 1 equaled a 50% (.50) benefit level; while lump sum percentages 2 and 3 equaled 75% (.75) and 100% (1.00) benefit levels respectively. The numbers within the test matrix are the percentages electing each option. Therefore, Block 1 represents everyone taking the current system (the lump sum amounts do not matter and all three columns will have equal costs). Block 2 compares costs for 75% of the retirees

Test Matrix 2				
Block	Option	Lump Sum=.500		
1	1	.60	.60	.60
	2	.20	.30	.40
	3	.10	.05	.00
	4	.10	.05	.00
2	1	.60	.60	.60
	2	.10	.05	.00
	3	.20	.30	.40
	4	.10	.05	.00
3	1	.60	.60	.60
	2	.10	.05	.00
	3	.10	.05	.00
	4	.20	.30	.40

Table 3.6. Test Matrix: Part 2

selecting the current system, while 25% select options 2, 3 and 4 equally. The three columns will have different costs since the lump sum amounts do, now, effect the outcome. For verification, column three costs must be more than column two costs which must be more than column one costs.

Table 3.6 tests different aspects of the proposed system. This matrix uses a lump sum percentage equal to .50 throughout. It evaluates the cost results between lump sum options. For example, Block 1 test the effects on costs of the number of people selecting option 2 versus options 3 and 4. In addition, this block test option 2 versus option 1 directly. This will give an idea of how the proposed option effects the current systems costs. It is estimated that 60% of retirees would select the current system option. This number is higher than the percentage selecting VSI/SSB which was approximately 50% (9). The rationale behind the larger number is that retirees are generally more conservative with their money and would be more likely to want an annuity because of their age. VSI/SSB takers were younger and more apt to continue working for a longer period of time.

In conclusion, the lump sum percentages variable was allowed to range from .5 - 1.00. The percentages selecting each option variable was allowed to range from

- Option 1: .50 - 1.00
- Option 2: .00 - .40
- Option 3: .00 - .40
- Option 4: .00 - .40

The results of these sixteen runs, each block is considered a run, may indicate a need for additional testing. This additional testing would experiment with any combinations of options that seemed reasonable using the first two test matrices. The additional runs would improve the sensitivity analysis while allowing informed experimentation with the proposed system.

IV. Results

4.1 Overview

This chapter discusses the findings of the research described in Chapter 3. These results were gathered by making multiple model runs. In addition to the runs proposed in the test matrices in Chapter 3, Section 3.14, twelve more alternatives were run. Figure 4.1 lists all the runs performed and the accompanying parameter values.

4.2 Findings

The findings of this research are broken down into two groups, cost and benefit dollars. The cost is the total amount of 1992 dollars needed to fund a particular alternative for twenty years. The benefit dollar calculations are the amount of money (both annuities and lump sums) an individual would receive for a particular alternative. These benefit dollars depend on the option (1, 2, 3 or 4) and the lump sum percentage chosen. As a reminder, option 1 refers to the current system, option 2 is the pay lump sum and medical annuity choice, option 3 is the medical lump sum and pay annuity choice, and finally, option 4 refers to both lump sums. For future reference, the reader should note the difference between *option* and *alternative*. *Option* always refers to the choice of a retiree (i.e. a retiree chooses option 2 which is the pay lump sum and a medical annuity). *Alternative* refers to the present worth cost associated with particular parameter values (i.e. 60% of all retirees choose option 1, 20% choose option 2, 10% choose option 3 and 10% choose option 4). Figure 4.1 displays the parameter values for each alternative and Tables 4.1 and 4.2 present the calculated costs.

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Alt 9	Alt 10	Alt 11	Alt 12	Alt 13	Alt 14	Alt 15	Alt 16
Percentages Selecting:																
Current System	1.00	.75	.50	.75	.50	.75	.50	.60	.60	.60	.60	.60	.60	.60	.60	.60
Pay	.00	.084	.167	.084	.167	.084	.167	.20	.10	.10	.30	.05	.05	.40	.00	.00
Med	00	.083	.167	.083	.167	.083	.167	.10	.20	.10	.05	.30	.05	.00	.40	.00
Both	.00	.083	.166	.083	.166	.083	.166	.10	.10	.20	.05	.05	.30	.00	.00	.40
Lump Sum Percentage	.50	.50	.50	.75	.75	1.00	1.00	.50	.50	.50	.50	.50	.50	.50	.50	.50

Test Matrix Numbers listed as Alternatives

	Alt 17	Alt 18	Alt 19	Alt 20	Alt 21	Alt 22	Alt 23	Alt 24	Alt 25	Alt 26	Alt 27	Alt 28
Percentages Selecting:												
Current System	.75	.75	.75	.75	.75	.60	.40	.75	.75	.60	.60	.60
Pay	.084	.084	.084	.00	.00	.00	.00	.25	.25	.20	.30	.35
Med	.083	.083	.083	.00	.00	00	.00	.00	.00	.00	.00	.00
Both	.083	.083	.083	.25	.25	.40	.60	.00	.00	.20	.10	.05
Lump Sum Percentage	.40	.20	.10	.45	.40	.40	.40	.40	.35	.40	.40	.40

Additional Runs

Figure 4.1. Alternative Listing

Alternative	Cost ($Billion)
1	171
2	193
3	215
4	209
5	231
6	225
7	279
8	201
9	217
10	199
11	193
12	235
13	190
14	186
15	252
16	180

Table 4.1. Alternative Costs for Initial Sixteen Runs

Alternative	Cost ($Billion)
17	186
18	173
19	167
20	172
21	167
22	166
23	161
24	171
25	167
26	168
27	170
28	171

Table 4.2. Alternative Costs for Twelve Additional Runs

4.2.1 Cost Findings. The first piece of information needed was the cost of option 1. This cost was calculated by the model with the following parameter values (also see Figure 4.1, alternative 1).

- Percentage Selecting
  - Current System = 1.00
  - Pay Option = .00
  - Med Option = .00
  - Both Option = .00
- Lump sum Percentage = .50

The 1.00 value for the current system parameter indicates that everyone selects option 1. The lump sum percentage parameter equal to .50 has no effect on the calculations. A value was needed for the model to run, however, the .50 is always multiplied by zero because no one takes the lump sum options. Therefore, any value could have been used for this parameter in alternative 1. The resulting present worth cost in 1992 dollars was:

$$\textit{Cost of Current System} = 171 \textit{ Billion Dollars}$$

This is the baseline cost. If the proposed system is to benefit the government and the retiree, the resulting cost must be less than this baseline. The model was run fifteen additional times to get cost values for alternatives 2 - 16 (see Figure 4.1 for the parameter values). These costs can then be used for comparison to the current system.

Figure 4.2 shows a bar graph with the costs for alternatives 1 - 16. It is apparent from the graph that alternative 1, the current system cost, is the most economical. The model also appears to be valid as far as relative costs are concerned.

Alternatives 2, 4, and 6 have the same parameter values for the percentages of personnel selecting each option but increasing lump sum values. Thus, the total cost values should rise from alternative 2 to 4 and from alternative 4 to 6. In addition, alternatives 3, 5, and 7 display the same parameter value characteristics in addition to increasing lump sum percentages. Again, these cost values are increasing as expected. Figure 4.3 shows alternatives 1 – 7 to display this relationship more concisely.

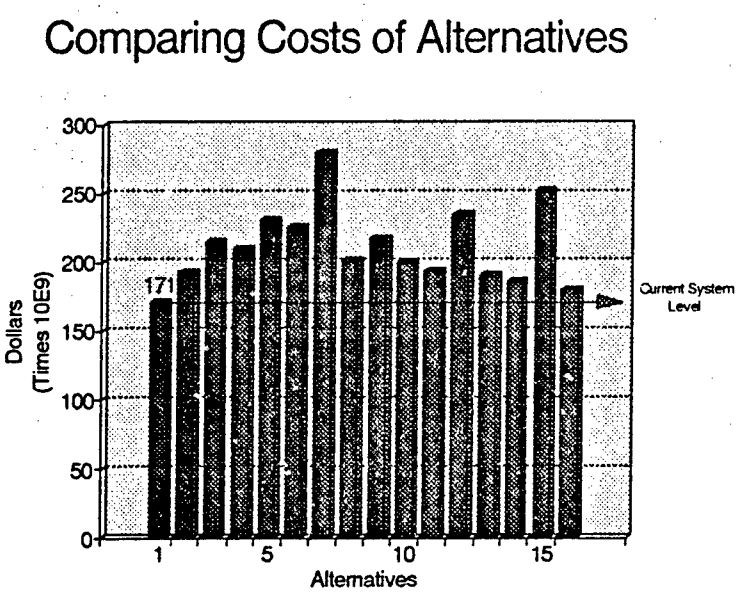


Figure 4.2. Initial Results

A comparison between alternatives 2 and 3 indicates that cost increases as more people select options 2, 3, and 4. Alternative comparisons between 4–5 and 6–7, confirm this finding. Therefore, the most expensive alternative of those discussed is alternative 7. It has only .50 percent of people choosing the current system with a lump sum percentage of 1.00.

Alternatives 8 – 16 explore the effect on cost of number of personnel selecting options 2, 3 or 4. These runs were designed keeping the number of people selecting

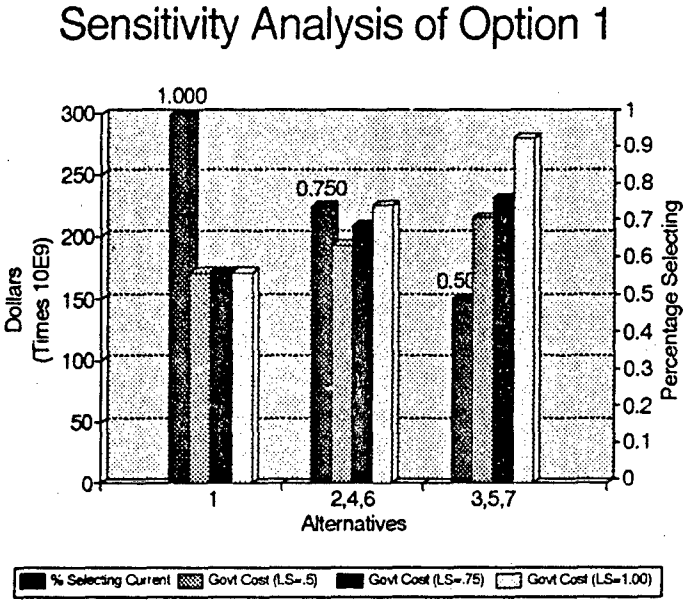


Figure 4.3. Sensitivity Analysis

the current system constant at 60% and the lump sum value constant at 50%. As Figure 4.2 shows, all these alternatives are at least less expensive than alternative 7 but more expensive than the current system. The parameter values were varied in a systematic manner within these alternatives. Alternatives 8, 9 and 10 have a parameter value split of .20, .10 and .10. Alternative 8 explores the difference between letting the percentage of personnel selecting option 2 equal .20, while the percentages of personnel selecting options 3 and 4 are .10. In a similar fashion, alternative 9 explores letting the percentage of personnel selecting option 3 equal .20, while the percentages of personnel selecting options 2 and 3 equal .10, and finally, alternative 10 explores letting the number of personnel selecting option 4 equal .20, while the percentages of personnel selecting options 2 and 3 equal .10. Alternatives 11 – 16 use this same systematic approach with a different split ratio. It is interesting to note the resulting relationships. Whenever option 3 has the highest split value, the cost is the greatest. When option 4 has the highest split value, the cost is the lowest.

This relationship is important so additional graphs were generated to compare costs to alternatives and parameter values selected.

Figures 4.4 through 4.6 show the changes in total cost as the split value rises for each option. Figure 4.4 indicates that total cost decreases as the percentage of people selecting option 2 increases. Figure 4.5 shows an increase in cost as the percentage of personnel selecting option 3 increases and Figure 4.6 indicates decreasing cost as the percentage of personnel selecting option 4 increases.

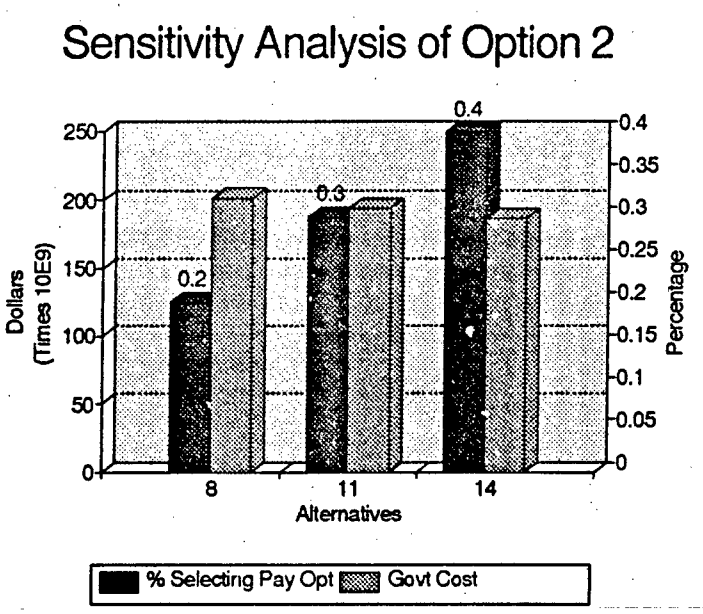


Figure 4.4. Effect of Pay Option on Cost

Figures 4.7 through 4.9 confirm these results. These graphs show the cost response as one option is held constant (in addition to option 1 being constant at .60) while the other two options are allowed to vary. For example, Figure 4.7 shows that the greatest cost ($252 billion) occurs when the number of people selecting option 3 is 40% and the lowest cost ($180 billion) when the percentage of people selecting option 4 is 40%. As long as retirees are allowed to select option 3, the cost will be greater than $180 billion. The other two graphs show similar results. Figure 4.8

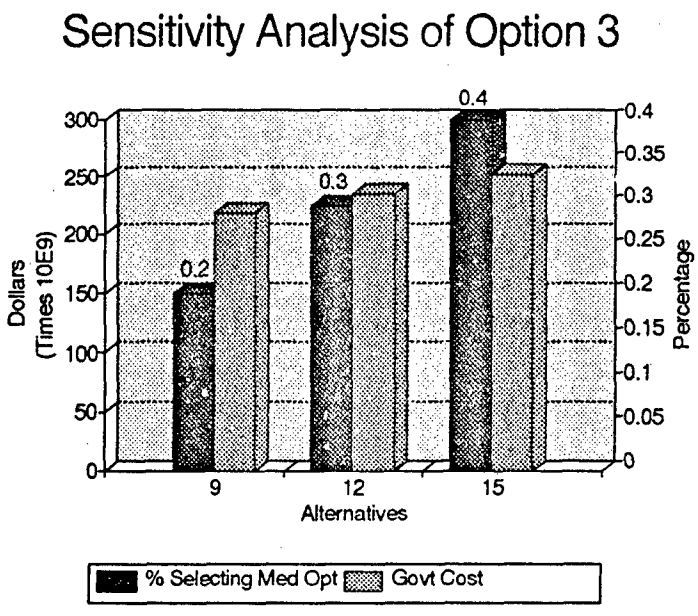


Figure 4.5. Effect of Med Option on Cost

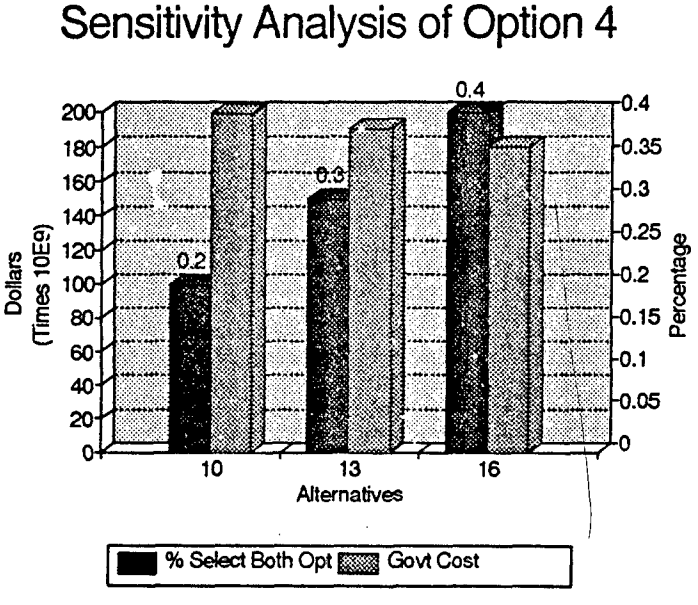


Figure 4.6. Effect of Both Option on Cost

indicates that option 4 is slightly cheaper than option 2 and Figure 4.9 shows that option 2 is cheaper than option 3. These results agree with those made using Figures 4.4 through 4.6.

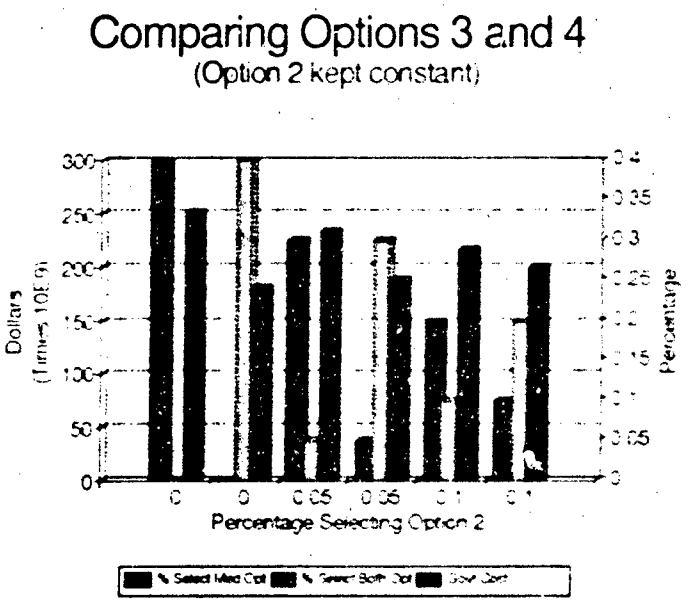


Figure 4.7. Effects of Holding Pay Option Constant

As a result of these initial test runs, additional test runs seemed necessary. The additional test runs were designed using knowledge from the first sixteen runs. The first three additional runs, alternatives 17 – 19, are listed in Figure 4.1. These alternatives were designed to determine what lump sum amount would be required to have the total cost of the alternative be less than the cost of the current system. An even break out between options 2, 3, and 4 was used because in real life these values could not be controlled. Therefore, with no data suggesting otherwise, the option percentages were divided evenly. Figure 4.10 displays the results of all twelve runs. Consequently, a lump sum value of 10% of the original benefit amount, corresponding to alternative 19, would have to be used to attain the desired result.

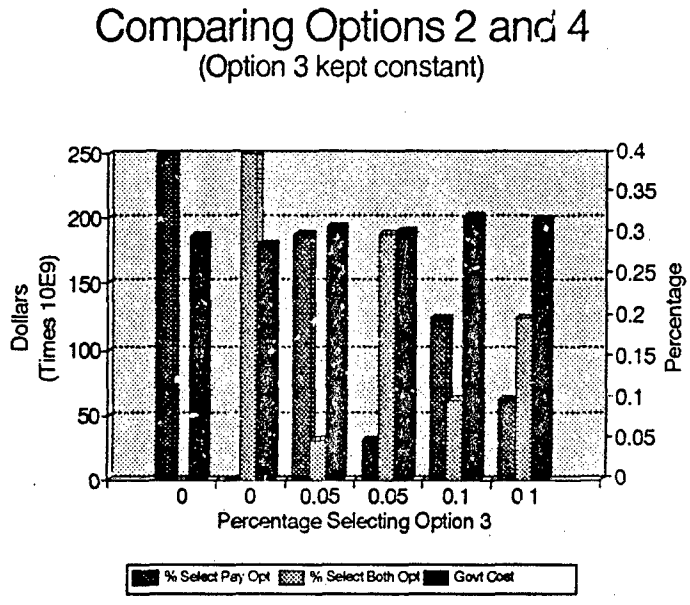


Figure 4.8. Effects of Holding Med Option Constant

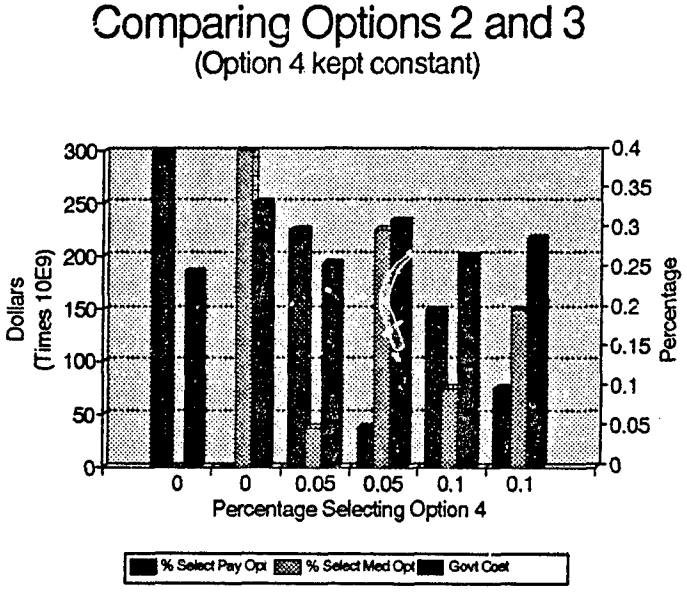


Figure 4.9. Effects of Holding Both Option Constant

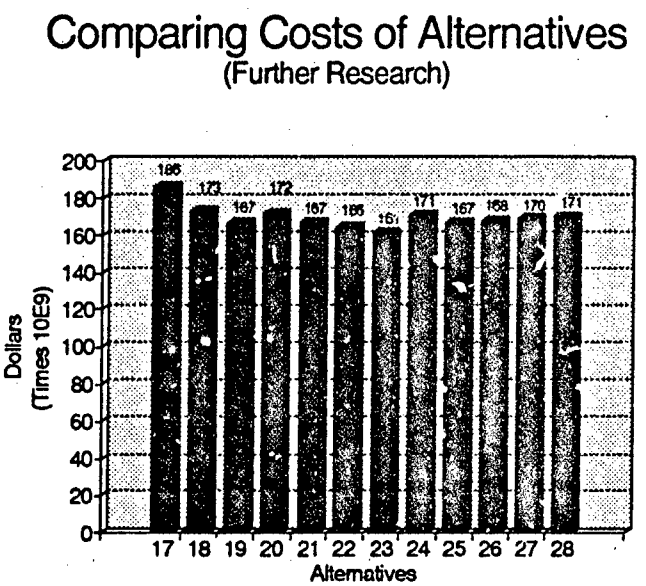


Figure 4.10. Additional Runs Results

The second set of additional runs used the knowledge that option 4 had the best potential for lowering cost. Alternatives 20 – 23 were designed to take advantage of this knowledge. The parameter values are shown in Figure 4.1 and the results are displayed in Figure 4.10. Alternatives 20 and 21 reduced the lump sum amount until the total cost was less than the current system. Alternatives 22 and 23 changed the percentage of people selecting option 1 and 4 to check sensitivity to these numbers. These runs correspond to a "new" proposed system. In this new system retirees would only be allowed to select the current system or both lump sums. In other words, options 2 and 3 would not be offered. Three out of the four alternatives resulted in a cost reduction from the current system cost of $171 billion. In addition, the retiree would get 40% of his/her total benefit amount under these alternatives.

The third set of runs, alternatives 24 and 25, tested cost changes due to option 2. Only options 1 and 2 were available to retirees in these two alternatives. At

the 35% lump sum percentage, alternative 25 is more economical than the baseline system.

Finally, alternatives 26 - 28 were run to test combinations of options 1, 2 and 4. All three alternatives had lower overall cost values than the current system. Alternative 28 approaches the limit on percentage of personnel selecting option 2. If more than 35% of the retirees select option 2 with a lump sum percentage equal to .40, and a percentage of personnel selecting option 1 equal to .60, the alternative will cost more than the current system.

4.2.2 Benefit Dollar Findings. Many of the alternatives cost more than the current system over a twenty year study period. However, there were nine alternatives that cost less. Hence, the next step in analyzing the results was to look at the alternatives from the individual's point of view. The only difference in alternatives from the individual's point of view is in the lump sum percentage. The greater the lump sum percentage, the greater the lump sum of money he/she will receive. The model calculated the value of the benefit dollars for the average officer, warrant officer and enlisted member. Of course, members with more years or greater rank would receive more money, while members with less years or lower rank would receive less money. For purposes of this study, an average officer would have 23.5 years of service and a rank of Lieutenant Colonel. A warrant officer would reach Chief Warrant Officer 3 and have 23.5 years of service while the average enlisted retiree would have 22 years of service and reach Master Sergeant.

Figures 4.11 through 4.13 display the benefit dollars corresponding to the value of the lump sum percentage parameter. Remember, the benefit dollar amount includes both annuity and lump sum amounts. Therefore, all four options must have the same value at the 100% benefit level. Note that in actual computations the values calculated for the current system were slightly greater than those calculated for options 2 - 4. The difference occurs because retirees succumb in the current

system and not in options 2 – 4. In other words, a weighted sum approach was used to calculate the benefit dollar values (see chapter 3, section 3.10). PAY, MED, and BOTH spreadsheet sets do not consider deaths, so the number of personnel remains constant during the entire twenty year study period. However, under the current system (option 1), the size of the retiree population does decrease due to deaths. Thus, the number of people used in the weighted sums equation should change every year. Since this was not practical to implement, an average of the highest and lowest numbers were used. Since the numbers calculated in GROUP were within a few thousand dollars of those calculated in PAY (less than 3% difference), the benefit dollar values calculated by PAY were used. This PAY value was easily calculated and should be fairly accurate. Additionally, since the numbers were so close to agreement, there is a high confidence in the accuracy of the PAY values.

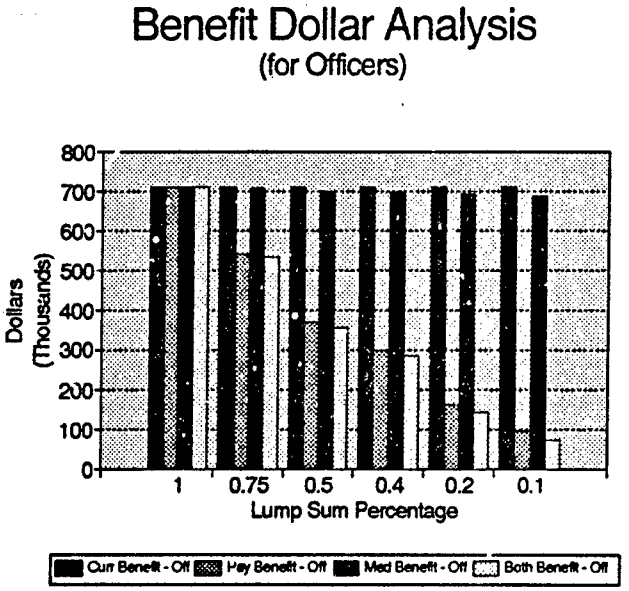


Figure 4.11. Benefit Dollars for Officers

Figures 4.11 through 4.13 indicate two important results. First, the benefit dollar values decrease as the lump sum percentages decrease. These values must

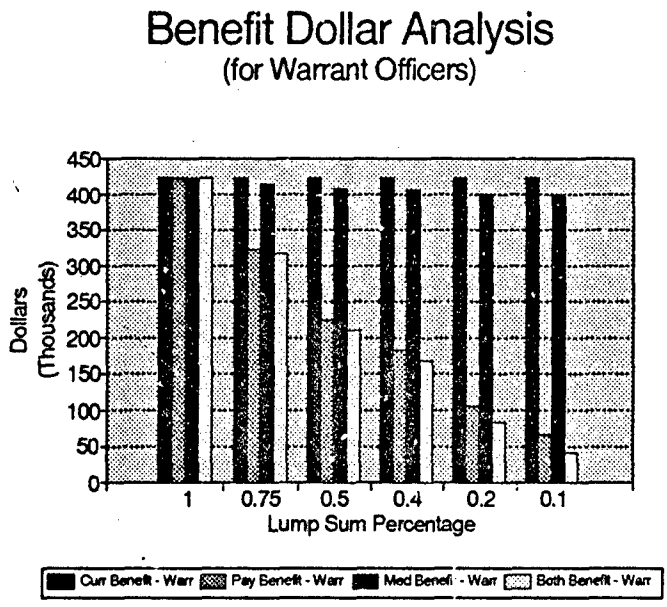


Figure 4.12. Benefit Dollars for Warrant Officers

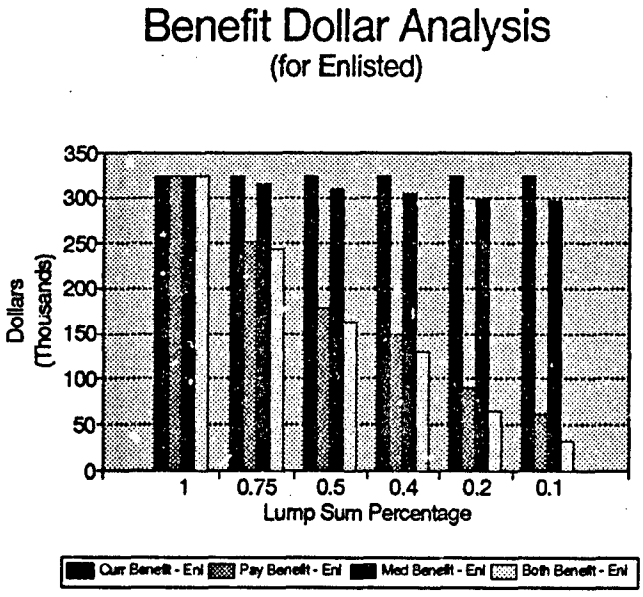


Figure 4.13. Benefit Dollars for Enlisted

decrease if the model is valid. Second, option 1 always gives the greatest benefit because it is not reduced by changing the lump sum percentage. It is interesting to note the relative values of options 1 and 3. These values are very close together because the medical lump sum amount is small in comparison to other costs. Options 3, 2 and 4, respectively, exhibit decreasing benefit dollars for the individual. This corresponds to the findings on the cost of the options. It is important to remember that the proposed system was offering a choice between an annuity and a lump sum amount. Therefore, individuals may still want lump sum options if the lump sum amount is greater than some threshold value. The actual lump sum amount and interest rates available are important issues to the retiree.

In addition to looking at the lump sum amounts, calculations were performed on these amounts to see what interest rates would be necessary to at least equal the current system benefit level. Three different alternatives were analyzed. These alternatives were 19, 21 and 25. Alternative 19 was analyzed to see what interest rate would be needed to make the lump sum amounts profitable (greater than the 100% benefit level) over a twenty year period. This alternative had a lump sum percentage equal to 10% of the full benefit level. Alternative 21 was analyzed for the same purpose, however, it was assumed in this alternative that retirees only had options 1 and 4 available to them. A lump sum percentage value of .40 was used. Alternative 25 was similarly analyzed with options 1 and 2 available and a lump sum percentage equal to 35%. These parameter values are all shown in Figure 4.1. The actual lump sum dollar amounts will be looked at first for all possible lump sum percentage values. Then the additional analysis will be presented for these three alternatives.

Figures 4.14 through 4.16 display the results of the lump sum computations. First, the model checks because option 4 should always have the largest lump sum amount (in fact, it is the sum of options 2 and 3). The second interesting result is that option 3 has a much lower lump sum value than option 2 and 4.

Figures 4.17 through 4.19 display the results of the analysis on alternative 19. The analysis involved applying different interest rates to the lump sum portions of the options and a constant 7.5% interest rate to the annuities. The 7.5% was used because it is the assumed interest rate for the current system used by the Actuary. For example, option 2 has a pay lump sum amount and a medical annuity. The lump sum amount was projected over a twenty year period with different interest rates and the medical annuity was projected over the same period at 7.5%. The two values were then combined to determine the overall amount an individual would receive. This analysis assumes the individual invests the full lump sum for the whole twenty year period at that particular interest rate. In scenario, it would take an interest rate somewhere between 20 and 22% to equal the current system benefit level. At 22% the retiree, whether officer, warrant or enlisted, would increase his/her benefit level above that of the baseline system.

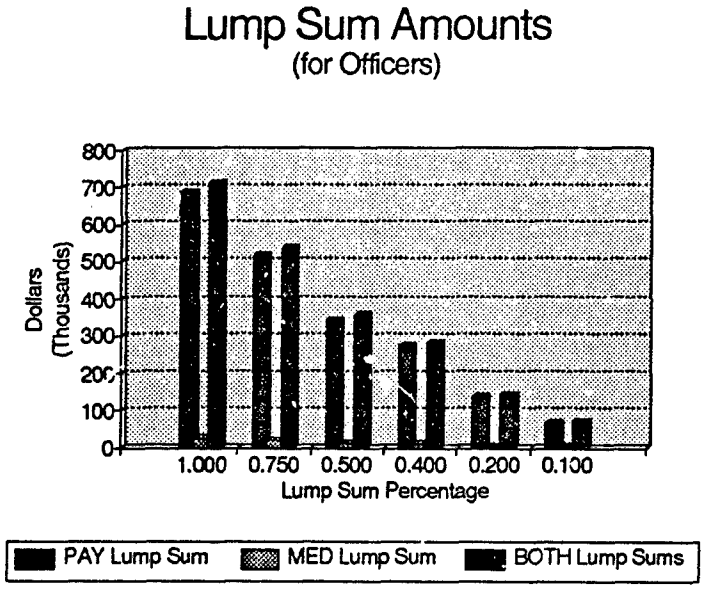


Figure 4.14. Lump Sum Dollar Amounts for Officers

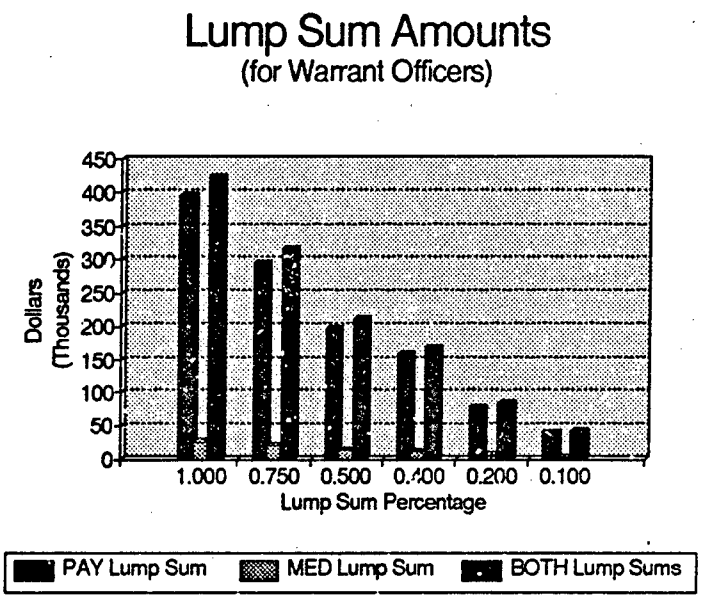


Figure 4.15. Lump Sum Dollar Amounts for Warrant Officers

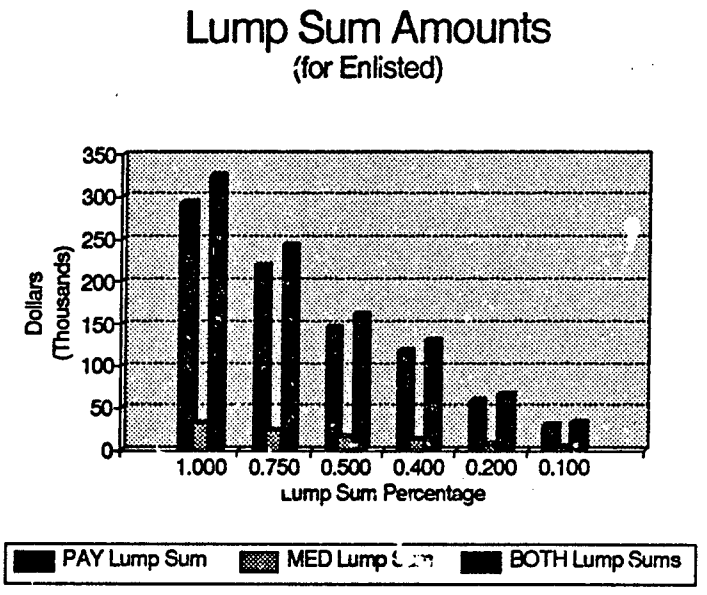


Figure 4.16. Lump Sum Dollar Amounts for Enlisted

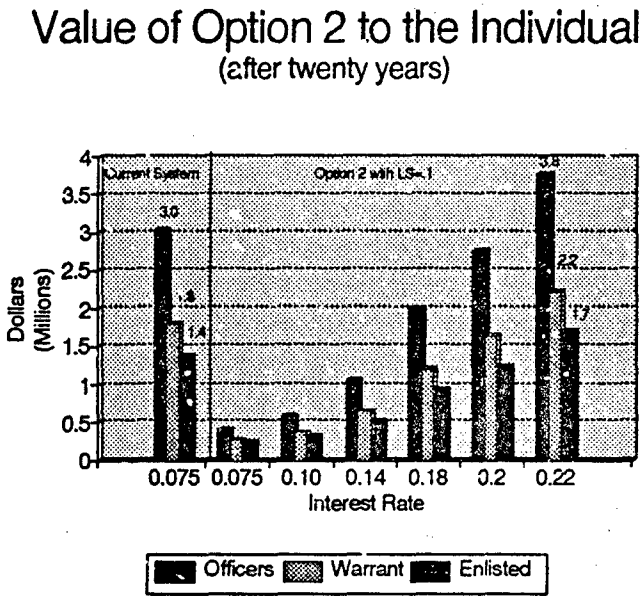


Figure 4.17. Individual Value of Alternative 19 – Option 2

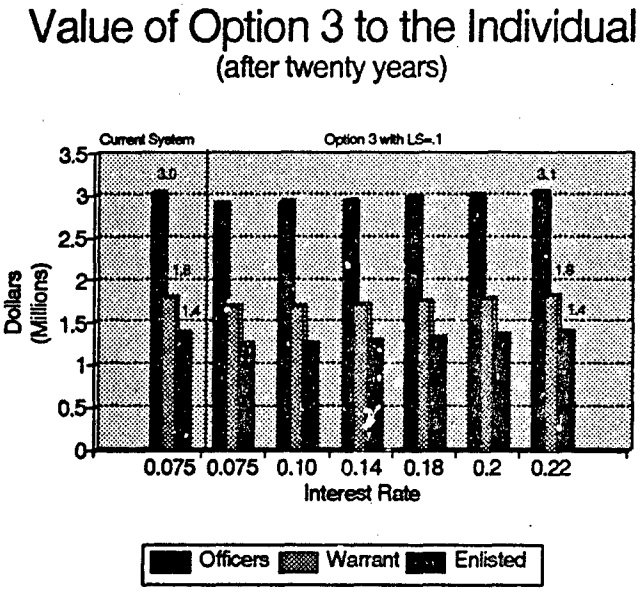


Figure 4.18. Individual Value of Alternative 19 – Option 3

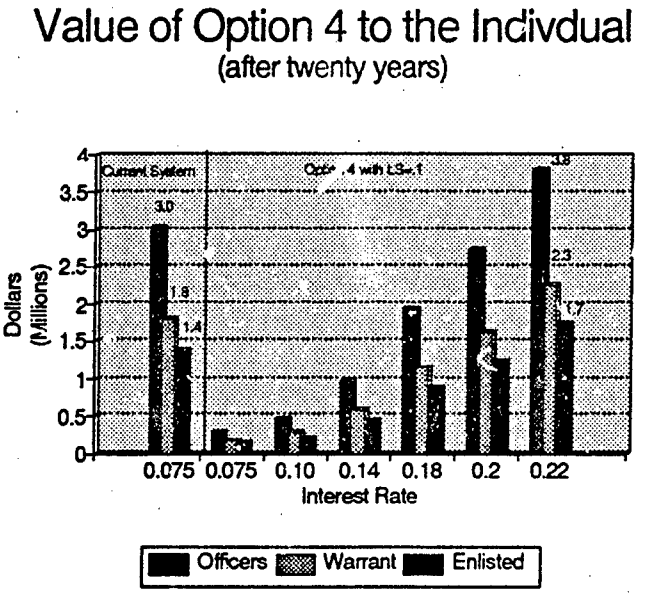


Figure 4.19. Individual Value of Alternative 19 – Option 4

Next, alternative 21 was analyzed. Figure 4.20 displays the outcome of this alternative. If we assume that retirees are only allowed to choose options 1 or 4, an interest rate of 12.5% will equal the current system benefit level over a twenty year period. An interest rate of 14% will increase the individual's benefit to over the 100% benefit level attainable by choosing option 1. Therefore, theoretically, an individual could increase his/her benefits by investing the whole initial lump sum at 14% for twenty years. This equates to roughly a 29% improvement over the current system for each retiree.

Finally, alternative 25 was analyzed from the individual's point of view. This alternative allowed retirees to choose options 1 and 2 only. As with alternative 21, the retiree would need to invest his/her lump sum for twenty years at 14% to get an increase in benefits. Figure 4.21 presents the dollar comparisons.

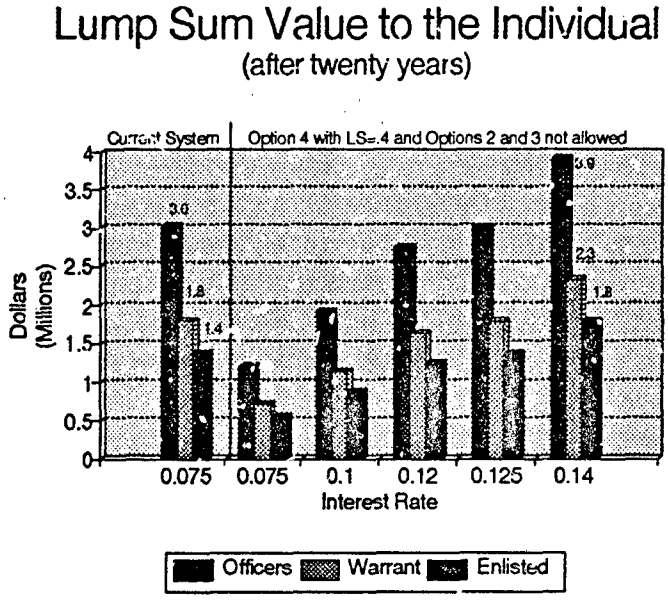


Figure 4.20. Individual Value of Alternative 21

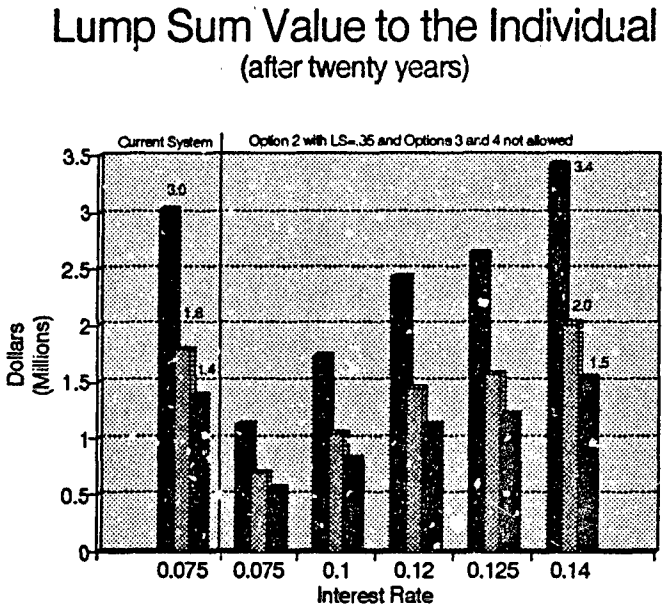


Figure 4.21. Individual Value of Alternative 25

V. Conclusions and Recommendations

5.1 Overview

This chapter discusses the conclusions of the research and gives recommendations for improving the model, plus ideas for further research. The conclusions are made using the results presented in Chapter 4. The recommendations were produced from knowledge gained creating, employing and analyzing the results of the model. As a reminder, option 1 is the current system, option 2 is the pay lump sum and medical annuity choice, option 3 is the medical lump sum and pay annuity, and option 4 refers to both lump sums. Additionally, *option* always refers to the individual retiree's choice. *Alternative* corresponds to a set of predetermined parameter values and the resulting costs.

5.2 Conclusions

Chapter 4 showed the cost of the current system to be approximately 171 billion dollars. The idea behind the research was to propose a new military retirement system which would cost the government less, while increasing the benefits to the retiree. A model of the proposed system was created and run for sixteen initial test cases. All sixteen runs cost more than the baseline (current) system. Therefore, none of these alternatives seemed realistic for implementation. However, insight was gained on the proposed system. The results showed option 3 was the most expensive, then option 2 and finally, option 4. In other words, it cost the government more money to buy a retiree out of the medical system than to support him/her for twenty years. However, the total cost of the alternative lessened when the government offered options 2 or 4. Thus, the first sixteen runs did not pass the criterion for implementation because the alternatives cost more than the current system. Therefore, the proposed system at those parameter values was unrealistic.

Further . . .is was done to determine what parameter values were needed for the proposed system to cost less than 171 billion dollars. Alternatives 19, 21 – 23, and 25 – 28 all cost less than the baseline system. Alternative 19, however, only gives retirees 10% of their overall benefit. It seems highly unlikely that many retirees would opt for this option. In fact, an analysis was done determining the interest rate needed, over a twenty year period, to equal the current benefit amount over that same period. For alternative 19, the individual retiree would have to make almost 22% interest on his/her money, whether he/she picked option 2, 3 or 4. An interest rate of this size for the entire twenty year period seems highly unlikely. The investment needed to obtain that interest rate would most probably be classified as highly risky. Therefore, once again, it seems unlikely that many retirees would take options 2, 3 or 4 or even perceive these options as an increase to their benefits.

Alternatives 21 – 23 show a somewhat different result. In these alternatives, the new proposed system allows the retiree to choose option 1 or 4 only. At a lump sum percentage equal to 40%, the proposed system costs less than the current system. In addition, the number of retirees selecting each option never changes the relative costs. Option 1 always costs more than option 4, no matter how many people select each option. This is a critical result because the DoD would not be able to control (or at least, it would be difficult to control) the number of people selecting each option. Thus, it is beneficial to the government to offer option 4 at the 40% lump sum percentage. But is it beneficial to the retiree? Once again, an analysis of interest rates was performed. In this scenario, a retiree would need to make approximately 12.5% over the twenty year period. And, if the retiree made 14% over this same period, he/she would actually increase his/her benefit by approximately 28% over that of the baseline system. It would be up to the retiree to determine if this was a realistic interest rate. However, it seems reasonable that more retirees would take the system tested by alternatives 21 – 23 than the system tested by alternative 19. In addition, a case can be made that alternatives 21 – 23 (the same system only

different selection rates) do offer an increase in benefits. This increase in benefits results from the fact that retirees have a viable (in some sense) alternative to the current system. The lump sum amounts received by the average retiree would be:

- Officer $285,374
- Warrant $168,917
- Enlisted $129,789

These dollar figures might tempt a retiree to take option 4 if he/she had plans for the money such as starting a company. Or, the retiree may not need or want the medical benefit so he/she would take the lump sum to get "something" for this benefit. The retiree must realize that he/she is giving up 60% of his/her overall benefit to get the lump sum now. In addition, he/she loses the annual income.

Alternative 25 is very similar to those discussed above. This alternative corresponds to a system where only options 1 and 2 are offered. The lump sum percentage is .35 and retirees would need to make 14% on their benefit level. These lump sum values are:

- Officer $240,442
- Warrant $138,542
- Enlisted $102,601

Finally, alternatives 26 - 28 offer only more choices for the retiree. In these alternatives the proposed system offers options 1, 2 and 4. The only problem with this new system is that in certain instances, the cost could be more than the current system. Additional sensitivity analysis would have to be done to quantify the cost relationship between options 1, 2 and 4. However, since it would be very hard (if legally and/or politically feasible) for the DoD to control percentages selecting each option, this system would need further study before it could be implemented. At

this point in time, the combination of options 1, and 2 and 4 could not be offered without potentially violating the cost constraint of the current system.

Option 3 is removed from every system because of its high annuity cost and the fact that no one leaves the system through death. It appears that option 3 increases costs because all retirees choosing this option keep their pay annuity which has a much greater effect on costs than the medical lump sum. The medical lump sum increases the overall option costs because every retiree gets this lump sum prior to death.

The current system seems to benefit from the fact that mortality rates are used in the cost calculations. In this option, the cost to the government decreases as more retirees succumb. Options 2, 3 and 4 do not get this luxury in the model. In addition, worst case computation of cost is used in PAY, MED, and BOTH. Therefore, the current system starts out with an advantage in the comparisons. This was done intentionally. If the proposed system (alternative) show a lower cost than the baseline cost, the government is assured of a cost savings.

No research can decide what is the best option for an individual retiree. However, in general, it appears that the only viable system for both the government and the retiree would be:

- Option 1 – offered
- Option 2 – not offered
- Option 3 – not offered
- Option 4 – offered
- Lump Sum Percentage – .40

where option 1 refers to the current system, option 2 is the pay lump sum with the medical annuity choice, option 3 is the medical lump sum and the pay annuity choice, and finally, option 4 refers to both lump sums. In this system, the total cost

is dependent on how many retirees choose option 1 versus option 4. The greater the number choosing option 4, the lower the cost to the government.

5.3 Recommendations

5.3.1 Improvements to the Model.

(a) PAY, MED and BOTH spreadsheets do not use the mortality of retirees in estimating costs. This overestimated the cost of options 2 and 3. It would be interesting to see the affect on costs of introducing mortality rates in these two spreadsheets.

(b) If better medical cost data could be found, the research would be strengthened by using this improved data and re-running the model.

(c) The model removed a retiree's family from the health care costs when the retiree turned 65. This is not accurate. To compensate for this removal, the number of dependents per retiree was increased from 1.15 to 1.5. This was to ensure overestimation of cost (worst case). However, if appropriate data could be found, the model could leave the retiree's dependents in the health care cost calculations.

(d) No attempt was made to vary the discount rate, although the model does have this capability. This would seem like an appropriate extension to the sensitivity analysis.

(e) Quattro Pro is an excellent package. However, it was cumbersome to use in this model because of the size of the spreadsheets. The spreadsheets had many repetitive sections to account for yearly changes in pay, health care costs, COLA etc. This model would have been much easier to implement and run as a FORTRAN based model. In a FORTRAN model, only one year's cost would have been modeled with variables increasing the appropriate costs the next year. This would have greatly increased the

ability to do sensitivity analysis, especially with regard to the time period studied. As stated below, a longer time period would seem appropriate. However, because of the difficulties of implementing this using Quattro Pro, the researcher did not increase the study period. Therefore, before any further research is attempted with this model, it should be converted to a FORTRAN based model. Quattro Pro, on the other hand, was ideal for displaying the results of the research.

5.3.2 Further Study.

(a) The time period of twenty years is questionable since life expectancy is continuing to rise. The time period should be expanded to thirty yeas to see the results on the costs of the alternatives. This additional study would test sensitivity to length of time on the retirement system payroll. This analysis could also be applied to other studies that suggest limiting time in the retirement system by increasing the benefit age to 62 or 65. Additionally, the relative costs between options may change, contradicting the results presented in this thesis.

(b) The percentages selecting each system were arbitrary variables selected by the researcher without any data to support the actual values. Additional research could quantify these numbers through a questionnaire and then re–run the model to get cost estimates.

(c) The individual retirees' point of view was briefly examined. Continued research may include analysis on what interest rates are reasonable for the next twenty plus years and would the retiree benefit at a low, moderate, or high risk investment. Additionally, the number of personnel willing to take 40% of his/her benefit level for investment money (and the potential for making more) should be quantified.

(d) This model allows for different lump sum percentages between options. However, this feature was not used in the runs. Different lump sum values could be used for each option to access the benefit to the individual and the cost to the government. Also, an attempt could be made to quantify what lump sum percentages a retiree would be willing to accept. For example, a retiree may take option 3 if he/she received 20% of the benefit amount but would take option 2 only if 60% of the benefit level were offered. How would these changes affect the total cost to the government and could all four options then be offered?

(e) The model could be expanded to show the cost reduction achieved by reducing the number of beneficiaries using the medical system. The current model only calculates costs for the health care system. It does not include any analysis on reducing the workload for medical personnel, which in turn would open up more space available slots for retirees choosing to keep their benefits. The more direct care (military facility) slots available to the retirees, the lower the number of CHAMPUS claims; resulting in a reduced cost to the government. These "indirect" cost savings are not modelled.

5.4 Summary

The proposed military retirement system would cost less than the current system if options 1 and 4 were offered at a lump sum percentage equal to 40% of the benefit level. A retiree taking option 4, would meet the current system level at 12.5% interest over a twenty year period and beat the current system at a 14% rate. Individual retirees would have to decide if these interest rates were realistic or attainable for them. In addition, the retiree would have to decide if receiving 40% of the total benefit, in return for a lump sum amount now, is worthwhile. As far as the government is concerned, this proposed system would decrease cost relative to the

current system. In fact, the higher the number of personnel selecting option 4, the lower the cost to the government. Therefore, the DoD should implement this system and encourage retirees to take option 4. Additionally, further study is needed on a system where options 1, 2 and 4 would be available.

Appendix A. Calculations and Referenced Information

A.1 Reduct/Growth Table

The following information shows how the reduct/growth factors were calculated for use in changing the force numbers from year to year. The Base numbers used were:

- Base(Off) - 10680
- Base(Enl) - 28797

These numbers were used for the following computations. The base number was subtracted from the projection for the selected year. This difference was then divided by the base number to get a fraction (percentage). This fraction was added to one resulting in the Reduct/Growth factor. An example of this procedure follows in equations A.1 through A.8.

$$Projected(Off)\ for\ 1993 = 10336 \tag{A.1}$$

$$Projected(Enl)\ for\ 1993 = 29531 \tag{A.2}$$

$$\begin{aligned} Difference(Off) &= Projected(Off) - Base(Off) \\ &= 10336 - 10680 \\ &= -344 \end{aligned} \tag{A.3}$$

$$\begin{aligned} Fraction(Off) &= \frac{Difference(Off)}{Base(Off)} \\ &= \frac{-344}{10680} \\ &= -.0322 \end{aligned} \tag{A.4}$$

$$Reduct/GrowthFactor(Off) = 1 + (-.0322) \quad \text{(A.5)}$$

$$\begin{aligned} Difference(Enl) &= Projected(Enl) - Base(Enl) \quad \text{(A.6)} \\ &= 29531 - 28797 \\ &= 734 \end{aligned}$$

$$\begin{aligned} Fraction(Enl) &= \frac{Difference(Enl)}{Base(Enl)} \quad \text{(A.7)} \\ &= \frac{734}{28797} \\ &= .0255 \end{aligned}$$

$$Reduct/GrowthFactor(Enl) = 1 + (.0255) \quad \text{(A.8)}$$

The calculations shown in these equations were repeated for nineteen years. Table A.1 lists all the factors used in personnel calculations.

A.2 Death Rates

This section was produced using the data supplied by the Actuary (8:K4–K7,J2–J5). The numbers in both death rate charts are estimated death rates updated for the improvement over time of these rates. The initial rates are for 1992. These rates are good until 1994. Then a new projection is used for years 1995–1999. These new projections are the old death rate multiplied by the appropriate number from the table in the *Valuation of the Military Retirement System* report (8:150). This was done for all the time periods between 1992 and 2014. Additionally, these values were computed for individuals ranging from 42 to 71 for Officers and Warrant Officers and from 40 to 69 for Enlisted personnel. The Officers and Enlisted personnel were

	Baseline Difference		Calculated Factors	
Year	Officers	Enlisted	Officers	Enlisted
1993	-344	734	1-.0322	1+.0255
1994	-440	1912	1-.0412	1+.0664
1995	-464	2678	1-.0434	1+.0930
1996	-246	3964	1-.0230	1+.1377
1997	0	6532	1+.0000	1+.2268
1998	182	9297	1+.0170	1+.3229
1999	363	10358	1+.0340	1+.3597
2000	358	10970	1+.0335	1+.3809
2001	362	11899	1+.0340	1+.4132
2002	360	12095	1+.0337	1+.4200
2003	523	12483	1+.0490	1+.4335
2004	682	12429	1+.0639	1+.4316
2005	855	11547	1+.0801	1+.4001
2006	807	11342	1+.0756	1+.3939
2007	658	10905	1+.0616	1+.3787
2008	595	10427	1+.0557	1+.3621
2009	551	8644	1+.0516	1+.3002
2010	21	5326	1+.0020	1+.1850
2011	712	1546	1-.0667	1+.0537

Table A.1. Force Growth/Reduction Factors

broken up because during certain periods the numbers can be significantly different. Tables A.2 and A.3 lists the final death rate values used. In the spreadsheet, the number is actually one minus the death rate. This is due to the fact the number of personnel remaining is needed and not the number of people that died.

A.3 NPV Calculations

The following information is provided for the reader's interest. It is an overview of the NPV function used in calculating present worth values. The information was taken directly from the Quattro Pro Manuals.

Format: @NPV(Rate,Block,[Type])

Rate = a numeric value representing a fixed periodic interest rate

Block = a cell block containing expected cash flow information

Type = an optional argument indicating whether the cash flows occur at the beginning or end of the period

@NPV calculates the current value of a set of estimated cash flow values (block), discounted at the given interest rate (Rate). It is helpful in determining how much an investment is currently worth, based on expected earnings, although its accuracy is entirely dependent upon the accuracy of the cash flow table.

@NPV has an optional third argument, Type, which is not compatible with 1-2-3. Type can be 0 or 1, depending on whether the cash flows are at the beginning or the end of the period. (this use of Type is the same as for the other financial functions. As with the other financial functions, the default value is 0. See "Financial functions" on page 11 for more information.)

The formula for @NPV(Rate,Block,Type)–if Block consists of V1,...Vn–is given by

If Type = 0:

$$\frac{V1}{(1+Rate)} + \ldots + \frac{Vn}{(1+Rate)^n}$$

If Type = 1:

$$V1 + \frac{V2}{(1+Rate)} + \ldots + \frac{Vn}{(1+Rate)^n}$$

For example, suppose you are considering investing $5000, and you expect a return of $2000 in each of the next four years. Put the values -500, +2000, +2000, +2000, +2000 in the block A1..A5. The net present value, using a discount rate of 10%. is @NPV(.1,A1..A5,0)=1340. alternatively, you can combine the initial investment with the present value of the returns yourself with +A1+@NPV(.1,A2..A5,0)=1340.

The cash flow table you reference should show expected income and debits over a period of time. Quattro Pro assumes that the amounts are received at the beginning of regular intervals and that the length of this interval is the same as the period on which interest is compounded. In other words, if monthly cash flow is estimated, Rate needs to show monthly interest. To convert annual interest to monthly interest, simply divide by 12.

	Years				
Age	1992-1994	1995-1999	2000-2004	2005-2009	2010-2014
42	.00091	.00089	.00088	.00088	.00088
43	.00110	.00108	.00107	.00106	.00106
44	.00130	.00127	.00126	.00126	.00125
45	.00152	.00149	.00148	.00147	.00146
46	.00175	.00172	.00170	.00169	.00169
47	.00200	.00196	.00195	.00194	.00193
48	.00226	.00222	.00220	.00219	.00218
49	.00255	.00251	.00249	.00248	.00247
50	.00287	.00283	.00281	.00279	.00278
51	.00321	.00316	.00314	.00301	.00312
52	.00358	.00353	.00350	.00349	.00348
53	.00400	.00395	.00392	.00390	.00389
54	.00446	.00440	.00437	.00435	.00433
55	.00496	.00489	.00486	.00484	.00482
56	.00548	.00540	.00537	.00534	.00532
57	.00601	.00593	.00589	.00586	.00584
58	.00655	.00646	.00641	.00639	.00636
59	.00715	.00705	.00700	.00697	.00694
60	.00785	.00774	.00769	.00765	.00762
61	.00870	.00858	.00852	.00848	.00845
62	.00972	.00959	.00952	.00948	.00945
63	.01094	.01080	.01073	.01069	.01064
64	.01233	.01370	.01362	.01356	.01350
65	.01386	.01372	.01364	.01358	.01352
66	.01553	.01538	.01530	.01523	.01517
67	.01732	.01717	.01707	.01700	.01693
68	.01922	.01906	.01896	.01888	.01880
69	.02125	.02108	.02097	.02088	.02079
70	.02345	.02326	.02314	.02305	.02295
71	.02587	.02567	.02554	.02543	.02533

Table A.2. Corrected Death Rates for Officer Retirees

	Years				
Age	1992-1994	1995-1999	2000-2004	2005-2009	2010-2014
40	.00159	.00156	.00154	.00154	.00153
41	.00169	.00166	.00164	.00163	.00163
42	.00184	.00180	.00179	.00178	.00177
43	.00204	.00200	.00198	.00197	.00196
44	.00227	.00223	.00220	.00219	.00218
45	.00255	.00250	.00248	.00246	.00246
46	.00287	.00282	.00279	.00278	.00276
47	.00325	.00319	.00316	.00315	.00313
48	.00370	.00364	.00361	.00359	.00358
49	.00420	.00413	.00410	.00408	.00407
50	.00478	.00471	.00467	.00465	.00464
51	.00542	.00534	.00531	.00528	.00526
52	.00612	.00604	.00600	.00597	.00595
53	.00689	.00678	.00675	.00672	.00669
54	.00773	.00762	.00757	.00754	.00751
55	.00866	.00854	.00848	.00845	.00841
56	.00968	.00955	.00948	.00944	.00940
57	.01081	.01066	.01059	.01054	.01050
58	.01202	.01185	.01177	.01172	.01167
59	.01333	.01314	.01305	.01300	.01294
60	.01474	.00774	.00768	.00765	.00762
61	.01625	.01602	.01591	.01584	.01578
62	.01789	.01765	.01753	.01745	.01738
63	.01967	.01942	.01930	.01921	.01914
64	.02155	.02130	.02117	.02108	.02010
65	.02353	.02328	.02315	.02305	.02296
66	.02558	.02534	.02519	.02509	.02499
67	.02772	.02747	.02732	.02721	.02710
68	.03000	.02975	.02959	.02946	.02934

Table A.3. Corrected Death Rates for Enlisted Retirees

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	March 1992	Master's Thesis

4. TITLE AND SUBTITLE
Cost Constrained Improvements to the Military Retirement System

5. FUNDING NUMBERS

6. AUTHOR(S)
Cynthia A. Brown

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Air Force Institute of Technology, WPAFB OH 45433-6583

8. PERFORMING ORGANIZATION REPORT NUMBER
AFIT/GOR/ENS/93M-1

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Distribution Unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

This research studies possible changes to the current military retirement system. The current military retirement system refers to the system provided under the Military Reform Act of 1986. A new system is proposed which would provide the retiree with four options. Option 1 would provide a pay annuity and medical benefits to the retiree (this is the current system). Option 2 would provide a pay lump sum in place of the annuity and would offer medical benefits. Option 3 would offer the pay annuity but give a medical lump sum amount in place of the medical benefit. Finally, option 4 would provide both a pay and a medical lump sum amount. The research investigates the total cost to the government to decide whether the proposed system would be more economical than the current system. In addition, the lump sum amounts a retiree would receive are calculated for different benefit levels.

14. SUBJECT TERMS	15. NUMBER OF PAGES
Retirement, Costs, Military, Retirees, Healthcare	125
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UL

END

FILMED

DATE: 4-93

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